DOCUMENT RESUME

ED 065 342 SE 014 411

TITLE	U.S. Metric Study Interim Report: The Consumer.
INSTITUTION	National Bureau of Standards (DOC), Washington, D.C.
REPORT NO	NBS-SP-345-7
PUB DATE	Jul 71
NOTE	147p.; Seventh in a series of interim reports prepared for the Congress of the United States
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Catalog No. C 13.10-345-7, $1.25)
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	Attitudes; Consumer Economics; *Consumer Education; *Federal Programs; Measurement; *Metric System; Research; *Surveys
IDENTIFIERS	*United States Metric Study

ABSTRACT

This is the seventh in a series of reports from the U. S. Metric Study, conducted by the National Bureau of Standards, focusing on the effects of increasing metric usage on the consumer American. Information on three areas--the level of knowledge of the American about the metric system, problems which would be encountered with a national policy of metrication, and methods of public education on the metric system--was obtained from a study by the Survey Research Center (SRC) and papers from experts on consumer concern. About 1,400 family units, representing a cross section of the country, were interviewed by the SRC. Attitudes and knowledge levels were given index values based on answers to several questions. Findings indicate widespread satisfaction with the present system and opposition to conversion. It is also suggested that resistance is due primarily to ignorance about the metric system, since the vast majority of those well-informed strongly favored its adoption. Television was the most popular means of public education. Experts agreed that the advantages outweighed the costs and problems of the conversion and felt the major disadvantage was the psychological one of adjustment. The 16 papers cover topics such as food purchasing and preparation, metric labeling, ready-made clothing, sewing, household equipment and furnishings, automobiles, and attitudes. For related documents, see SE 014 409, 014 410, 014 412, and 012 591. (JM)

ED 065342

A UNITED STATES
DEPARTMENT OF
COMMERCE
PUBLICATION

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

U.S. METRIC STUDY INTERIM REPORT

THE CONSUMER

U.S. METRIC STUDY

U.S.
DEPARTMENT
OF
COMMERCE
National
Bureau
of
Standards
NBS SP 345-7

U.S. METRIC SUBSTUDY REPORTS

The results of substudies of the U.S. Metric Study, while being evaluated for the preparation of a comprehensive report to the Congress, are being published in the interim as a series of NBS Special Publications. The titles of the individual reports are listed below.

REPORTS ON SUBSTUDIES

NBS SP345-1: International Standards (issued December 1970, SD Catalog No. C13.10:345-1, Price $1.25)

NBS SP345-2: Federal Government: Civilian Agencies (issued July 1971, SD Catalog No. C13.10:345-2, price $2.25)

NBS SP345-3: Commercial Weights and Measures (issued July 1971, SD Catalog No. C13.10:345-3, price $1.00)

NBS SP345-4: The Manufacturing Industry (issued July 1971, SD Catalog No. C13.10:345-4, price $1.25)

NBS SP345-5: Nonmanufacturing Businesses (in press)

NBS SP345-6: Education (in press)

NBS SP345-7: The Consumer (this publication)

NBS SP345-8: International Trade (in press)

NBS SP345-9: Department of Defense (issued July 1971, SD Catalog No. C13.10:345-9, price $1.25)

NBS SP345-10: A History of the Metric System Controversy in the United States (in press)

NBS SP345-11: Engineering Standards (issued July 1971, SD Catalog No. C13.10:345-11, price $2.00)

NBS SP345-12: Testimony of Nationally Representative Groups (issued July 1971, SD Catalog No. C13.10:345-12, price $1.50)

COMPREHENSIVE REPORT ON THE U.S. METRIC STUDY

NBS SP345: To be published in August 1971

Those publications with catalog numbers have already been issued, and may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 for the prices indicated. Add one-fourth of the purchase price if the publication ordered is to be sent to a foreign address. Be sure to include the SD Catalog number with your order.

U.S. METRIC STUDY
INTERIM REPORT

THE CONSUMER

Seventh in a series of reports prepared
for the Congress

U.S. METRIC STUDY
Daniel V. De Simone, Director

National Bureau of Standards
Special Publication 345-7

UNITED STATES DEPARTMENT OF COMMERCE
Maurice H. Stans, *Secretary*
NATIONAL BUREAU OF STANDARDS
Lewis M. Branscomb, *Director*

Nat. Bur. Stand. (U.S.), Spec. Publ. 345-7, 152 pages (July 1971)
CODEN: XNBSA

Issued July 1971

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
(Order by SD Catalog No. C13.10:345-7), Price $1.25
Stock Number 0303-0864

LETTER OF TRANSMITTAL

THE HONORABLE PRESIDENT OF THE SENATE
THE HONORABLE SPEAKER OF THE HOUSE OF REPRESENTATIVES

SIRS:

I have the honor to present the seventh in the series of interim reports stemming from the U.S. Metric Study, prepared by the National Bureau of Standards.

This Study was authorized by Public Law 90-472 to reduce the many uncertainties concerning the metric issue and to provide a better basis upon which the Congress may evaluate and resolve it.

I shall make a final report to the Congress on this Study in August 1971. In the meantime, the data and opinions contained in this interim report are being evaluated by the Study team at the National Bureau of Standards. My final report to you will reflect this evaluation.

Respectfully submitted,

Maurice H. Stans
Secretary of Commerce

Enclosure

LETTER OF TRANSMITTAL

Honorable Maurice H. Stans
Secretary of Commerce

Dear Mr. Secretary:

I have the honor to transmit to you another interim report of the U.S. Metric Study, which is being conducted at the National Bureau of Standards at your request and in accordance with the Metric Study Act of 1968.

The Study is exploring the subjects assigned to it with great care. We have tried to reach every relevant sector of the society to elicit their views on the metric issue and their estimates of the costs and benefits called for in the Metric Study Act. Moreover, all of these sectors were given an opportunity to testify in the extensive series of Metric Study Conferences that were held last year.

On the basis of all that we have been able to learn from these conferences, as well as the numerous surveys and investigations, a final report will be made to you before August 1971 for your evaluation and decision as to any recommendations that you may wish to make to the Congress.

The attached interim report includes data and other opinions that are still being evaluated by us to determine their relationship and significance to all of the other information that has been elicited by the Study. All of these evaluations will be reflected in the final report.

Sincerely,

Lewis M. Branscomb

Lewis M. Branscomb, *Director*
National Bureau of Standards

Enclosure

TABLE OF CONTENTS

Page
Letters of Transmittal iii, iv
Foreword vi
I. Summary 1
II. Nature of the Consumer Study 3
III. Survey of Consumer Knowledge and Attitudes 6
IV. Selected Areas of Consumer Concern 31
Appendix 1. Metric Study Act 138
Appendix 2. Glossary 139

FOREWORD

The U.S. Metric Study needed to determine the attitudes of Americans toward the metric system and their knowledge of it. This was done through a representative sample of American households surveyed by the Survey Research Center of the University of Michigan under the direction of Professor George Katona.

In this volume, Professor Katona and his staff at the Survey Research Center report on their efforts to determine:

(1) How much the American people know about the metric system,
(2) Their attitudes toward the use of it,
(3) Their opinions regarding conversion to it, and
(4) Their preferences as to what methods should be used to improve public knowledge about it.

To supplement the report of the Survey Research Center, several papers on selected areas of consumer interest are included in this volume. We are grateful to the individuals and organizations who contributed these papers and to the American Home Economics Association and its Executive Director, Dr. Doris Hanson, who arranged for their preparation.

Reports covering other substudies of the U.S. Metric Study are listed on the inside front cover. All of these, including this report, are under evaluation. Hence, they are published without prejudice to the comprehensive report on the entire U.S. Metric Study, which will be sent to the Congress by the Secretary of Commerce in August of 1971.

The preparation of this volume was coordinated by Bruce D. Rothrock. Other members of the Metric Study staff who assisted him were Jeffrey V. Odom, Robert W. Carson, Mrs. Linda J. Luhn, Miss Jean M. Simon, Mrs. Evelyn Tallerico, and Miss Debora Gilbert.

In this, as in all aspects of the U.S. Metric Study, the program has benefited from the independent judgment and thoughtful counsel of its advisory panel and the many other organizations, groups, and committees that have participated in the study.

Daniel V. De Simone, *Director*
U.S. Metric Study

I. SUMMARY

The Metric Study Act of 1968 (Public Law 90-472) called for an extensive study of the present and future effects of increasing worldwide and domestic metric usage on various activities in the United States. The Consumer Study was directed to these effects as they apply to the individual American.

A portion of the Consumer Study involved a survey of attitudes and opinions of consumers and their level of knowledge of both the customary and metric systems of measurement. In another portion, experts presented views on the present impact of metrication on selected consumer activities and the possible future effects with no national program to increase metric use; or, alternatively, with a planned program of metrication.

The sample survey disclosed that a majority of consumers are satisfied with the customary system, that they know very little about the metric system, and that they could be expected to react with apathy and indifference to any planned conversion program. Those who did not react favorably to metrication gave as reasons, "inconvenience of a change," and "satisfaction with the present system." However, many of them admitted that metrication did have some advantages. Those who thought it was a good idea to change explained, "It is used by most other countries," and "It is a decimal system and easier to use."

The fact that a majority of the respondents were unable to name a single metric measure, and relatively few were familiar with either the relationships within the metric system or the relationship of metric units to customary units, suggests that much of the resistance to possible conversion stems from a lack of knowledge of the metric system. This was corroborated by the fact that those who were familiar with the metric system generally favored conversion, emphasizing the advantages and minimizing the disadvantages.

The level of knowledge of the metric system was apparently related to the educational level and to the age of the respondent. Young people and highly educated people generally were more knowledgeable. Respondents seemed more familiar with prefixes and the relationship of base units and subunits in the metric system than with the relationship of metric measures to customary measures.

Experts submitting papers in selected areas of consumer concern verified that customary units and standards are used almost exclusively in consumer activities. They reported that the consumer is generally satisfied with the customary system and is little affected by the increasing worldwide use of the metric system. In many situations the consumer is totally unaware of the fact that a purchased item may involve metric language, components, or standards.

Particular emphasis was directed to the lack of standardization in areas such as retail clothing and foods, and the promulgation of unsystematic and confusing practices, especially in consumer product information. To some consumers this situation is confusing and frustrating. For example, ready-to-wear clothing is offered to the consumer in a proliferation of illogically conceived sizes, and, similarly, processed foods are packaged in such a variety of sizes as to make price comparison almost impossible.

The experts almost unanimously agreed that conversion problems and costs would be confined to the transition period, and once completed, the advantages would outweigh the costs and inconveniences of the changeover.

Some of the direct advantages mentioned were simplification of calculations, elimination of ambiguities in measurement units (e.g., dry and liquid pints and ounces), and increased facility in foreign travel. Metrication was also visualized as the opportunity and possibly the incentive to introduce improved standards for clothing sizes, simplification of package and can sizes, elimination of confusing practices in consumer product information, and possible standardization at the international level.

There was unanimous agreement that the major disadvantage of planned metrication would be a psychological one of adjustment. Successful conversion would require a massive program of public education.

II. NATURE OF THE CONSUMER STUDY

BACKGROUND OF THE U.S. METRIC STUDY

Since its inception in France in 1790, the use of the metric system has steadily increased throughout the world. With the decision in 1965 by Great Britain to begin a 10-year program of changing to the metric system, and with the subsequent announcements by South Africa, New Zealand, Australia, and Canada that they were planning to change to metric, the United States was left as the only major industrial country not on the metric system or committed to changing over.

This trend, along with other considerations, led the U.S. Congress in 1968 to pass the Metric Study Act, Public Law 90-472 (app. 1), calling for a study of the present and future effects of metrication in the United States, and an investigation of the desirability of increasing the use of metric weights and measures. The Act outlined a comprehensive investigation of all sectors of the society.

The three basic issues of the U.S. Metric Study are:

What is the present impact within the United States of increasing worldwide use of the metric system?

What would this impact be in the future, assuming that the use or nonuse of the metric system continues as at present, with no coordination among the various sectors of the society?

Alternatively, what would be the effect of a coordinated national program to increase the use of the metric system?

ISSUES OF THE CONSUMER STUDY

All consumers are confronted with measurements. They purchase, use, create, and relax with units of measurement. Who can escape pounds, inches, yards, miles, cups, and degrees Fahrenheit in food and clothing purchases, football games, automobile use, food preparation, and weather reports? These patterns of use establish a sense of familiarity and an engendered complacency. But how much of the customary measurement system does the consumer really comprehend? And what are the advantages and disadvantages of its use?

Increasing worldwide use of the metric system presents new units for possible use by manufacturers and retailers. Any change adopted by them ultimately will confront the consumer. Consumers have already witnessed the change in dual labels on grocery store items, in prescription medicine, and in track events. Claims have been made by consumer spokesmen that the metric system would be to the consumer's advantage. What are these advantages?

The Consumer Study investigated these and other questions as follows: the extent of the consumer's knowledge of measurement units; the system of units in use in selected consumer activities, and their advantages and disadvantages; the effect on the consumer of the increasing worldwide use of the metric system; the possible advantages and disadvantages of changing to the metric system; attitudes and opinions concerning a planned change to the metric system; and means of informing and educating the consumer should there be a planned program of metrication.

METHODOLOGY

For 20 years the Survey Research Center (SRC), Institute for Social Research at the University of Michigan, has studied the consumer's level of information and attitudes in many areas. Professor George Katona of SRC afforded the opportunity for a metric survey to be conducted as a piggy-back to their ongoing quarterly economic consumer survey. This arrangement had the advantage of obtaining information on consumers' knowledge of measurement systems and their attitudes toward metric, at a lower cost than a full-scale survey would entail. A survey totally devoted to the metric issues was not possible because of financial limitations.

This personal interview survey used a sample of approximately 1,400 family units representative of all family units living in private dwellings in the continental United States. Twenty-two questions, about one-quarter of the total survey, were devoted to metric issues. They first explored the respondent's level of knowledge of the customary system and the metric system, and his familiarity with relationships between units in the metric and customary systems. Respondents indicating that they had used another measuring system while living or traveling abroad were queried concerning their experience.

Six questions asked opinions concerning the respondent's ability to adjust to metric units. Then he was asked whether it would be a good or a bad idea for the United States to change to the metric system and why. Finally, respondents were asked to agree or disagree with six statements presented as arguments either in favor of or opposed to conversion. The results of this survey are contained in chapter III of this report.

The Consumer Study also investigated the advantages and disadvantages of the present system of measurement and the possible future effects of planned metrication. Consumer spokesmen concurred that these objectives could be attained most successfully by asking experts to prepare papers on selected consumer activities. With the assistance of the President's Committee on Consumer Interest, all national, state, and local consumer groups were invited to submit information and comments pertaining to the metric issues. The American Home Economics Association (AHEA) offered their cooperation and assistance, and convened a steering committee of notable consumer spokesmen. This assured broad consumer representation in the determination of the areas of consumer concern, and in the selection of experts to prepare papers on them. The areas selected for study were food, clothing, the home, transportation, and consumer attitudes and education.

Each invitee prepared a paper based on guidelines related to the issues of the study. These papers are contained in chapter IV of this report.

A National Metric Study Conference on Consumer Affairs was held in cooperation with the AHEA on October 12-13, 1970, at the National Bureau of Standards, Gaithersburg, Maryland. At this conference the invitees summarized their analyses. The conference was open to the public and all interested organizations and persons were invited to attend.

III. SURVEY OF CONSUMER KNOWLEDGE AND ATTITUDES

SUMMARY AND CONCLUSIONS

A study of public attitudes concerning a change from the customary measurement system to a new and unfamiliar system found that a program of planned metrication could be expected to encounter general opposition from the consumer. It is probable that most people have had satisfactory, or at least not adverse, experience with the prevailing system and that few people are knowledgeable about metric measurement. In these circumstances, the findings of this survey are encouraging for proponents of conversion: 33 percent of respondents favored a change to the metric system.

The survey confirmed that the vast majority of Americans have little knowledge of metric measures. Only 40 percent of the respondents were able to name even a single metric measure. Less than 20 percent were familiar with either the relationships within the metric system or the relationships of metric measures to measures in the current system. Much resistance to conversion seems to stem from this lack of information. The objections to conversion mentioned most were inconvenience and confusion.

Despite widespread opposition to conversion, many agreed with reasons for use of the metric system which were presented during the interview. Thirty-four percent of the respondents agreed that conformity with other countries was desirable; 47 percent thought a decimal measuring system would make price comparisons easier; 55 percent agreed that the metric system would be easier than the customary system for children to learn.

What of the probable direction of future changes in public attitudes? Would public opinion be persuaded by an educational program designed to win support for conversion? Some of the survey evidence indicates that the answer is "Yes." Receptivity to a change to metric measurement varied significantly among persons with different levels of knowledge about the metric system. The majority of most knowledgeable persons favored conversion, giving substantive arguments supporting their position. This suggests that much of the opposition is born of a lack of knowledge and that an opportunity exists to develop interest in metrication.

PURPOSES OF THE STUDY

The major aim of the survey was to provide information with respect to three issues: (1) What is the level of knowledge of the American people concerning the metric system? (2) What problems would be encountered by private households in the event of a national program to increase domestic usage of the metric system? (3) What methods of educating the American public could be used to ease the problems in the event of a national program of metrication?

For two decades the Survey Research Center has specialized in the study of attitudes and their relation to behavior. Generally, attitude studies relate to familiar situations or events. Assessing public attitudes concerning the metric system posed some new problems of investigation since it could not be assumed that many people were knowledgeable about metric measurement or the issue of domestic conversion. Therefore, we attempted to make the survey an information-giving as well as an information-gathering device. Throughout the interview the metric system was compared with the customary system, areas of daily activity in which measurement plays a part were indicated, and respondents were given information on the advantages of metrication as well as some problems of conversion. Furthermore, lack of public knowledge required a modification of the Center's traditional methods of measuring attitudes. Usually attitudes are studied in a conversational interview consisting primarily of open-end questions; respondents express their opinions and the answers are recorded in their own words. In this case, it was decided that simple statements to which respondents agreed or disagreed would elicit more information. Consequently, extensive use was made of fixed-choice questions supplemented with a few open-end questions.

What use can be made of the findings obtained from the survey? Information concerning the nature and extent of the educational problem is vital if a metrication program is embarked upon. Information on prevailing public opinion indicates the positive attitudes upon which an educational plan could build and the concerns against which it must work. The survey indicates what needs to be explained to the people, the extent of present resistance to increased domestic usage of the metric system, and therefore the direction an educational program must take in order to win support for such a change. It cannot, however, confirm how easily people would be persuaded by more information, how they would react to compelling arguments for change, nor therefore the intensity of effort needed to make a conversion campaign successful.

Details of the survey method are discussed in a later section labeled Survey Methods. Suffice it to say here that the method known as multistage area probability sampling was used to select a sample of dwelling units representative of the nation. All family units found in each selected dwelling unit were chosen for an interview, and the head of the family unit was designated as the preferred respondent. The sample consisted of 1,400 family units, representing the approximately 62 million family units in private households in the coterminous United States. The interviewing was conducted between October 9 and November 15, 1970.

LEVEL OF INFORMATION ABOUT THE METRIC SYSTEM

Respondents were asked a series of questions designed to explore their level of information about the metric system. Initially respondents were asked "Have you ever heard of the metric system?" A "yes" response prompted the query, "Could you tell me the names of some measures in the metric system?" Respondents naming at least one metric measure were then probed about relationships within the metric system and metric equivalents to English measures.

Responses to the questions quoted above can be summarized easily in the form of an "Index of Information," in which each respondent is given points as follows:

- 1 point for having heard of the metric system
- 1 to 2 points for naming metric measures

    1 point for one *type* of measure
    2 points for two or more types of measure

- 1 point for correctly identifying the number of centimeters in a meter
- 1 point for knowing the relationship between kilometers and miles (answers of 1.5-2.0 kilometers in a mile were accepted).

The percentage distribution of the Index of Information is indicated in figure 1. Thirty percent of the total sample indicated that they had not heard of the metric system (a score of zero on the index), and almost 60 percent were unable to name even a single metric measure. Only 9 percent of respondents scored four points, and 3 percent scored five on the information scale.

Among respondents who correctly named only one metric measure, the meter was by far the most prevalent response. Twenty-five percent identified one metric measure and of these 92 percent cited the meter.

Respondents were more familiar with the meanings of the prefixes used in the metric system than with the relationships of metric measures to customary measures. Forty-two percent of respondents were asked, "Do you happen to know how the metric measures relate to each other? For example: How many centimeters are in a meter?" and "Do you happen to know the relation of any metric measures to our customary measures? For example:

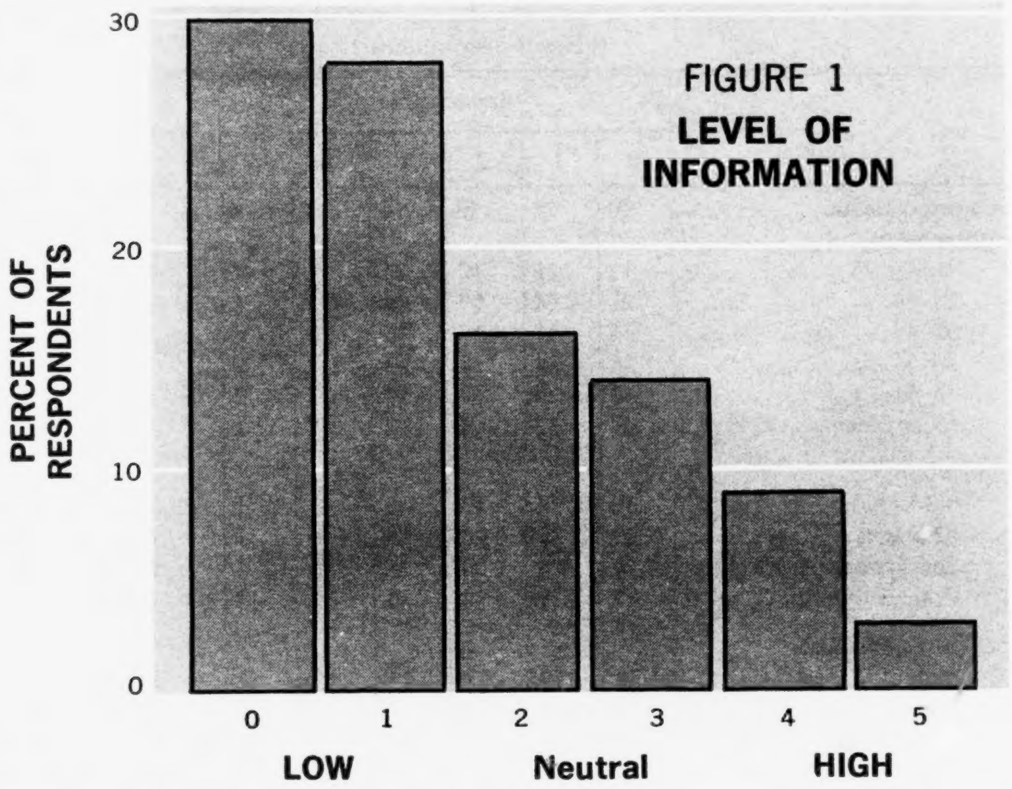


FIGURE 1
LEVEL OF INFORMATION

About how many kilometers are in a mile?" Among respondents asked the two questions, 43 percent knew the answers to the first question but only 17 percent knew the answers to the second.

A national program to increase domestic usage of the metric system would in all likelihood need to utilize diverse approaches to reach different groups of the population. Therefore, it would be of primary importance to investigate and identify systematic differences in information about the metric system among certain demographic classifications. The relationship between the Index of Information and various demographic variables is summarized in table 1.

Formal education is the single most important explanation of population differences in information about the metric system. Increasing years of education were associated with increasing metric knowledge. The educational categories specified in table 1 accounted for 32 percent of the variation in the Index of Information.

Persons of different age and sex had differing levels of information. Males scored higher on the index than females. Younger respondents were more knowledgeable than the older members of the sample.

The relationship between the index and the three variables (age, sex, and education) taken together is shown in table 2. Together the independent

Table 1. Index of Level of Information About the Metric System by Various Demographic Characteristics

(Percent distribution)

	Index value						Total	Number of cases
	0	1	2	3	4	5		
All respondents	30	28	16	14	9	3	100	(1402)
Age in years:								
Under 25	12	21	19	24	17	7	100	(148)
25–34	21	24	17	19	15	4	100	(258)
35–44	24	27	19	16	10	4	100	(237)
45–54	26	34	18	13	7	2	100	(279)
55–64	40	29	14	10	5	2	100	(199)
65 or older	49	32	8	7	3	1	100	(277)
Education:								
0–11 grades	55	27	10	5	2	1	100	(560)
12 grades	20	38	20	15	6	1	100	(419)
Some college, no degree	6	28	20	27	15	4	100	(243)
College degree	5	9	16	25	31	14	100	(175)
Sex of respondent:								
Male	22	29	17	17	11	4	100	(997)
Female	49	28	11	8	4	0	100	(398)

variables accounted for 42 percent of the variation in the index. Within all age and sex subgroups, higher levels of education differentiated respondents with high levels of metric knowledge from those with lower information levels. Higher index scores for males than for females were indicated for all age categories. Evidence of negative age correlation was found for persons with less than a college degree. However, in most of the subgroups in which significance was wanting, sample size was small and therefore statistical tests were unreliable.

An investigation was made of the relationship between a respondent's occupational class and his level of information. Although higher status occupation tended to be associated with more metric knowledge (table 3), this correlation was primarily an educational effect. After adjusting for education, the relation between occupational class and the index was maintained only for persons with less than a high school education.

EXTENT OF RECEPTIVITY AND OPPOSITION TO THE USE OF THE METRIC SYSTEM

One of the primary purposes of this study was to investigate and evaluate attitudes relating to the possible adoption of the metric system by the United States. Prior to asking respondents their opinions concerning metrication, it was necessary to provide them with information about metric measures and some of the arguments favoring domestic conversion. Therefore,

Table 2. Index of Information

(Percent distribution)

	Index value						Total	Number of cases
	0	1	2	3	4	5		
Males:								
Under age 35:								
0–11 grades	48	28	13	7	2	2	100	(60)
12 grades	14	32	25	19	8	2	100	(113)
Some college, no degree	1	18	17	32	25	7	100	(88)
College degree	2	6	11	29	35	17	100	(65)
Age 35–54:								
0–11 grades	34	37	19	6	2	2	100	(128)
12 grades	16	39	17	19	7	2	100	(137)
Some college, no degree	2	25	29	26	16	2	100	(51)
College degree	0	9	22	22	31	16	100	(55)
Age 55 or older:								
0–11 grades	51	31	9	6	3	0	100	(182)
12 grades	11	47	25	13	4	0	100	(55)
Some college, no degree	13	33	16	28	5	5	100	(39)
College degree	11	5	5	37	26	16	100	(19)
Females:								
Under age 35:								
0–11 grades	77	18	5	0	0	0	100	(22)
12 grades	28	28	19	16	9	0	100	(32)
College, with or without degree	0	17	26	30	27	0	100	(23)
Age 35–54:								
0–11 grades	73	14	9	2	2	0	100	(55)
12 grades	32	45	15	8	0	0	100	(53)
College, with or without degree	15	27	22	24	12	0	100	(33)
Age 55 or older:								
0–11 grades	76	18	3	1	2	0	100	(110)
12 grades	46	43	11	0	0	0	100	(28)
College, with or without degree	21	48	15	8	5	3	100	(38)

early in the interviews, respondents were told: "We in the United States use systems for measuring sizes, weights, and temperature which are different from those used in most other countries" and "Some people think that the relations in the metric system are easier to handle than the relationships in our customary system, such as 12 inches in a foot and 3 feet in a yard, because the metric system is based on the decimal system so that every measure can be easily divided or multiplied by 10." Respondents were then asked several questions concerning their willingness to change to the metric system. Included was the evaluative question: "Do you think it would be a good idea or a bad idea for the United States to change to the metric system of measure?"

Table 3. Index of Information by Occupation

(Percent distribution of persons in the labor force)

	Index value					Total	Number of cases
	0	1	2	3	4–5		
Occupation class:							
All members of the labor force	23	29	18	16	14	100	(1018)
White collar workers	11	28	19	20	22	100	(468)
Blue collar workers and service workers	34	30	17	12	7	100	(480)
Farm workers and miscellaneous groups	27	33	14	14	12	100	(70)
Education and occupation class:							
0–11 Grades:							
All members of the labor force	49	29	13	6	3	100	(330)
White collar workers	33	42	17	4	4	100	(75)
Blue collar workers and service workers	55	25	12	6	2	100	(231)
Farm workers and miscellaneous groups	46	25	12	17	0	100	(24)
12 Grades:							
All members of the labor force	17	38	21	16	8	100	(369)
White collar workers	14	38	21	19	8	100	(146)
Blue collar workers and service workers	18	38	21	16	7	100	(192)
Farm workers and miscellaneous groups	26	42	16	6	10	100	(31)
Some college, no degree:							
All members of the labor force	4	28	20	27	21	100	(171)
White collar workers	4	31	19	28	18	100	(109)
Blue collar workers and service workers	3	23	23	26	25	100	(53)
Farm workers and miscellaneous groups	0	20	20	30	30	100	(10)
College degree:							
All members of the labor force	2	10	17	25	46	100	(147)
White collar workers	2	10	17	25	46	100	(139)

Survey experience has shown that a single question often gives less satisfactory indications of underlying attitudes than does an index derived from a combination of questions. Thus a composite measure was developed to indicate receptivity to domestic usage of metric measurement. The aforementioned question was combined with six additional questions to construct the index. Respondents were asked to agree or disagree with six statements; three were presented as arguments favoring conversion, the others were opinions in opposition to such a change.

The index was constructed by assigning points as follows:

– Respondents answering that it would be a "good idea" to change to the metric system were given 2 points; those responding "bad idea" were given minus 2 points.

– 1 point was added for each of the following statements with which a respondent *agreed,* 1 point subtracted for each with which he *disagreed:*

"The U.S. should make the change because the rest of the world uses the metric system."

"Shopping and price comparisons would be easier because the metric system can be divided or multiplied by 10."

"The metric system would be easier than our present system for our children to learn."

– 1 point was added for each of the following opinions with which a respondent *disagreed*, 1 point subtracted for each with which he *agreed:*

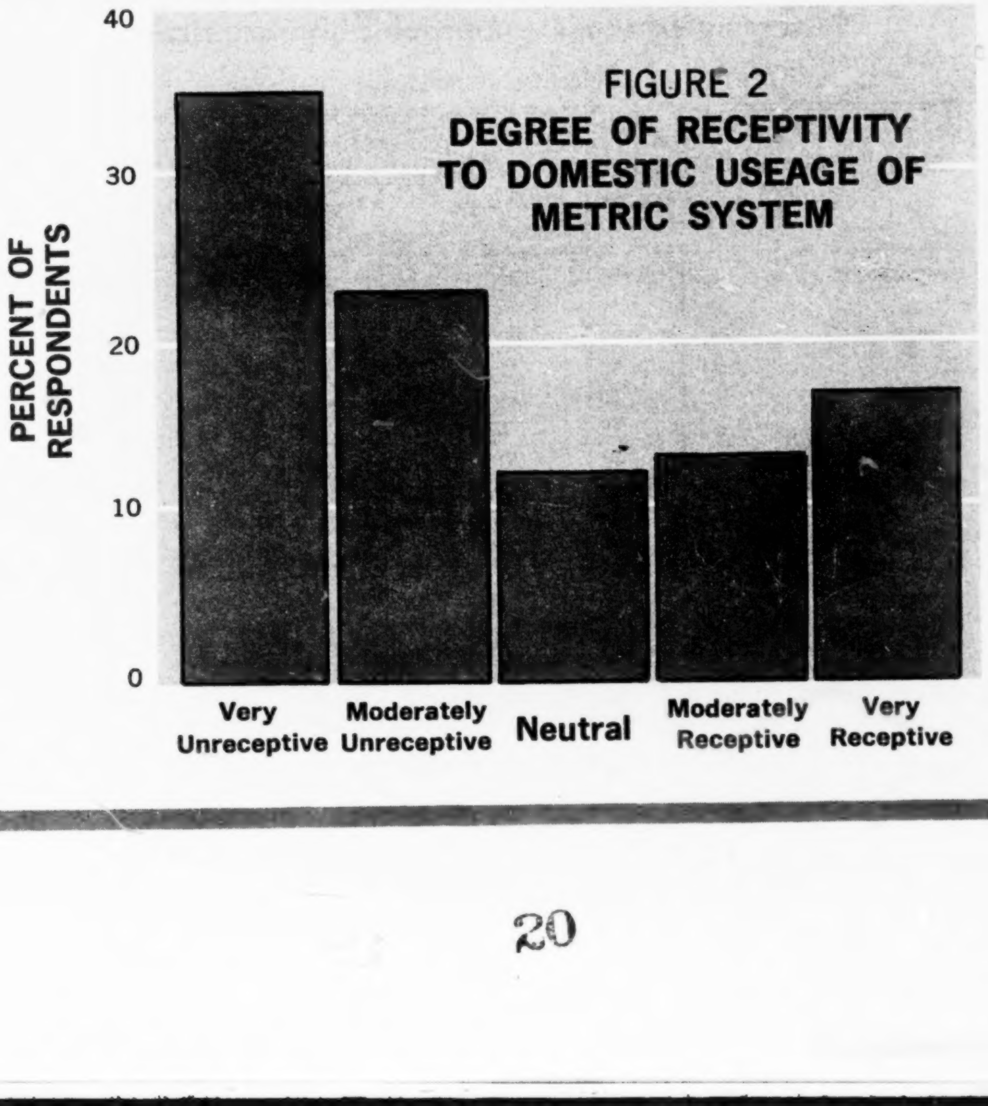
"Life would just be more complicated; we would have to use conversion tables and that would be difficult to handle."

"It would be too costly to change over our household measuring devices."

"It would be expensive for business to change their measuring equipment."

The resultant index ranged from a minimum of minus 8 (strongly opposed) to a maximum of plus 8 (very receptive). This range was then compressed into a 5-point scale as presented in figure 2.

The index can be compared to the single evaluative question; both attempted to measure willingness to adopt the metric system in the United States. In answer to the evaluative question, 25 percent of respondents said it would be a "good idea" for the United States to change to the metric system, while 59 percent responded "bad idea." According to the index, 30 percent of respondents expressed some degree of receptivity to conversion and 58 percent indicated some degree of opposition to the change.



Receptivity to domestic usage of the metric system, as measured by the index, and selected demographic characteristics are shown in table 4.

Persons of higher educational attainment were more likely to respond positively to adoption of the metric system; 60 percent of the respondents with a college degree tended to favor conversion. On the other hand, about 75 percent of the persons with less than a high school degree expressed opposition to the change.

Differences in the index among persons of different age and sex were significant, although the amount of variation which was accounted for by these variables was not large. Females expressed greater opposition to domestic use of the metric system than did males. Younger respondents were more willing to change than were older persons. Receptivity to adoption of the metric system was not influenced by differences in occupational class after adjustment was made for differences in educational attainment (table 5).

An important finding, and one which should be encouraging for proponents of metrication, was the high correlation of a respondent's knowledge about metric measurement and his receptivity to the use of the metric system in the United States (table 6). More than 50 percent of persons able to answer correctly all the questions which were used to measure the level of information, *strongly* favored adoption of the metric system. Even among persons with the same amount of education, there was a strong correlation between level of information and the index of willingness to change (table 7). This supports the hypothesis that an educational program

Table 4. Degree of Receptivity to Domestic Usage of the Metric System by Various Demographic Characteristics

(Percent of respondents)

	Very unreceptive	Moderately unreceptive	Neutral	Moderately receptive	Very receptive	Total	Number of cases
All respondents	35	23	12	13	17	100	(1402)
Age:							
Under 25	21	29	13	20	17	100	(148)
25–34	32	21	9	16	22	100	(258)
35–44	30	25	12	13	20	100	(237)
45–54	38	21	8	14	19	100	(279)
55–64	42	20	12	10	16	100	(199)
65 or older	45	22	17	7	9	100	(277)
Education:							
0–11 grades	46	25	14	8	7	100	(560)
12 grades	38	24	11	13	14	100	(419)
Some college, no degree	24	19	10	20	27	100	(243)
College degree	11	15	9	20	45	100	(175)
Sex of Respondent:							
Male	34	21	10	14	21	100	(997)
Female	40	27	16	9	8	100	(398)

Table 5. Degree of Receptivity to Domestic Usage of the Metric System by Occupation

(Percent distribution of persons in the labor force)

	Very unreceptive	Moderately unreceptive	Neutral	Moderately receptive	Very receptive	Total	Number of cases
Occupation class:							
All members of the labor force	34	22	11	14	19	100	(1018)
White collar workers	27	20	9	17	27	100	(468)
Blue collar workers & service workers	40	24	12	12	12	100	(480)
Farm workers & miscellaneous groups	33	26	14	14	13	100	(70)
Education and occupation class:							
0–11 Grades:							
All members of the labor force	48	25	11	8	8	100	(330)
White collar workers	53	25	5	12	5	100	(75)
Blue collar workers & service workers	48	25	12	7	8	100	(231)
Farm workers & miscellaneous groups	38	21	17	8	16	100	(24)
12 Grades:							
All members of the labor force	36	24	12	14	14	100	(369)
White collar workers	34	19	12	15	20	100	(146)
Blue collar workers & service workers	37	26	12	14	11	100	(192)
Farm workers & miscellaneous groups	36	32	13	19	0	100	(31)
Some college, no degree							
All members of the labor force	20	20	10	21	29	100	(171)
White collar workers	22	21	8	18	31	100	(108)
Blue collar workers & service workers	15	19	11	28	27	100	(53)
Farm workers & miscellaneous groups	20	20	20	20	20	100	(10)
College degree							
All members of the labor force	10	16	7	21	46	100	(147)
White collar workers	9	16	8	21	46	100	(139)

Table 6. Relationship Between Level of Knowledge About the Metric System and Receptivity to Conversion

(Percent of respondents)

	Very unreceptive	Moderately unreceptive	Neutral	Moderately receptive	Very receptive	Total	Number of cases
All respondents	35	23	12	13	17	100	(1402)
Value of index of information:							
0	49	27	16	6	2	100	(418)
1	45	25	11	10	9	100	(399)
2	30	21	10	17	22	100	(217)
3	18	18	7	24	33	100	(199)
4	13	9	9	22	47	100	(127)
5	0	10	12	21	57	100	(42)

Table 7. Degree of Receptivity to Domestic Usage of the Metric System

(Percent of respondents)

Education and level of information concerning the metric system	Very unreceptive	Moderately unreceptive	Neutral	Moderately receptive	Very receptive	Total	Number of cases
0–11 Grades:							
0 Score-index of information	48	28	17	6	1	100	(310)
1	47	24	12	8	9	100	(152)
2	43	17	12	16	12	100	(58)
3–5	28	22	5	12	33	100	(40)
12 Grades:							
0 Score-index of information	55	27	11	5	2	100	(83)
1	47	26	11	10	6	100	(161)
2	29	22	12	17	20	100	(82)
3–5	12	19	12	24	33	100	(93)
Some college, no degree:							
0–1 Score-index of information	41	21	14	13	11	100	(84)
2	25	25	10	6	33	100	(48)
3	18	17	8	28	29	100	(65)
4–5	2	11	4	37	46	100	(46)
College degree:							
0–2 Score-index of information	21	25	6	23	25	100	(52)
3	6	20	7	27	40	100	(45)
4–5	6	6	12	14	62	100	(78)

would be effective in overcoming resistance to conversion and in winning support for change.

OPINIONS ABOUT CONVERSION TO METRIC MEASUREMENT

To be effective, a program to encourage use of the metric system must focus on specific reasons for resistance to the change. The responses to the six statements included in the index of willingness to change provided insight into perceived advantages and disadvantages. Some of these responses are considered individually in this section.

Prior to the six fixed-choice questions, respondents were asked why they thought conversion to metric measurement would be a good or a bad idea. The distribution of their responses is presented in table 8.

Negative aspects of conversion were frequently mentioned. The most prevalent unprompted response was that conversion would create confusion and cause inconvenience. This was mentioned by 33 percent of respondents. A closely related opinion was voiced by 23 percent of respondents; they indicated that satisfaction with the present system was their primary objection to a change.

Several other survey questions were designed to measure how much inconvenience and difficulty people foresaw in adjusting to a different measuring system. Respondents were asked how much difficulty they thought the American people would have in adjusting if "speed limits were posted as 80 kilometers an hour instead of 50 miles an hour" and "the temperature reported as zero degrees Celsius instead of 32 degrees Fahrenheit." Seventy-four percent of respondents answered that there would be "considerable

Table 8. Advantages and Disadvantages of Conversion to Metric System

	Percent of respondents
Advantages of using metric system:	
Used by most other countries	15
Decimal system; easier system	14
Other advantages	1
Disadvantages of using metric system:	
Cost to household or business; would increase taxes	6
Satisfaction with present system	23
Difficult for older people to learn	11
Inconvenience of the change; complicated	33
Other disadvantages	3
Don't know, not ascertained	11
	(a)

---

[a] Total is greater than 100 percent since some respondents gave more than one reason. The question was: "Do you think that it would be a good idea or a bad idea for the United States to change to the metric system of measure? Why is that?"

difficulty" in adjusting to the former, and 64 percent expressed concern about the latter change.

Only 6 percent indicated concern about the cost of conversion. However, a large majority agreed with statements which presented cost considerations as an argument against conversion. Fifty percent of the respondents agreed that "it would be too costly to change over our household measuring devices" and 78 percent thought "it would be expensive for business to change their measuring equipment."

Whereas advantages of the metric system were mentioned spontaneously by less than 30 percent of respondents, the three statements of opinions favoring conversion elicited more positive attitudes. Thirty-four percent supported the proposition that "the United States should make the change because the rest of the world uses the metric system"; 47 percent agreed that price comparisons would be facilitated by a decimal measuring system; and 55 percent thought that metric measures "would be easier for our children to learn."

In general, respondents with higher education and those with more metric knowledge emphasized the advantages and minimized the disadvantages of metrication (tables 9-12). One notable exception was found in responses to the statement concerning cost to business of a change to the metric system. Over two-thirds of respondents with college diplomas and those informed about metric measures thought that cost to business would be a problem of conversion.

In summary: Although attitudes toward a change in the measurement system as expressed in this survey indicated opposition to use of the metric system and genuine concern with the problems of conversion on the part of the majority of the American public, a crucial question is how such attitudes would change in response to more information. Most people in the sample were confronted for the first time with metric measurement and it is not surprising that many echoed one respondent's opinion, "There are so many people who have never heard of it; it would be too confusing." Thus, the opinions and preferences of persons well-informed about the metric system may be considered relevant. The vast majority of these respondents favored conversion and gave reasons supporting a change.

ON METHODS OF EDUCATING THE PUBLIC ABOUT THE METRIC SYSTEM

An extensive investigation of the effectiveness of different media in reaching the general population or particular groups within the population was beyond the scope of this study. However, two questions were asked to explore individual preferences with regard to methods of educating the public about the metric system. Respondents were initially asked, "What do you think would be the best way to help people learn the new system? Do you think it would be better to use TV instructions, adult education courses, instructional leaflets, newspapers, or what?" This was followed with the

Table 9. Advantages and Disadvantages of Conversion to Metric System by Education

(Percent distribution)

	0–11 grades	12 grades	Some college, no degree	College degree
Advantages of using metric system:				
Used by most other countries	6	12	23	38
Decimal system; easier system	6	13	22	33
Other advantages	0	1	2	3
Disadvantages of using metric system:				
Cost to household or business; would increase taxes	4	6	5	4
Satisfaction with present system	26	24	17	12
Difficult for older people to learn	11	10	9	9
Inconvenience of the change; complicated	38	36	22	12
Other disadvantages	2	3	3	0
Don't know, not ascertained	17	10	7	6
	(a)	(a)	(a)	(a)
Number of cases	(560)	(419)	(243)	(175)

[a] Total is greater than 100 percent since some respondents gave more than one reason. The question was: "Do you think that it would be a good idea or a bad idea for the United States to change to the metric system of measure? Why is that?"

Table 10. Advantages and Disadvantages of Conversion to Metric System by Knowledge About Metric System

(Percent distribution)

	Score on index of information					
	0	1	2	3	4	5
Advantages of using metric system:						
Used by most other countries	1	8	21	9	33	48
Decimal system; easier system	1	5	18	28	45	53
Other advantages	0	0	1	2	3	4
Disadvantages of using metric system:						
Cost to household or business; would increase taxes	3	5	7	4	4	7
Satisfaction with present system	30	29	19	11	10	4
Difficult for older people to learn	9	12	14	11	8	5
Inconvenience of the change; complicated	37	41	31	25	18	2
Other disadvantages	3	3	4	4	1	1
Don't know, not ascertained	23	10	5	7	3	2
Number of cases	(418)	(399)	(217)	(199)	(127)	(42)

Table 11. Relation Between Some Components of Index of Receptivity and Education

(Percent distribution)

	0–11 grades	12 grades	Some college, no degree	College degree
"The U.S. should make the change because the rest of the world uses the metric system"				
Agree	22	32	46	64
Disagree	64	64	51	35
Don't know	14	4	3	1
Total	100	100	100	100
"Shopping and price comparisons would be easier because the metric system can be divided or multiplied by 10"				
Agree	34	47	60	73
Disagree	38	41	34	23
Don't know	28	12	6	4
Total	100	100	100	100
"The metric system would be easier than our present system for our children to learn"				
Agree	43	55	67	79
Disagree	25	24	18	12
Don't know	32	21	15	9
Total	100	100	100	100
"Life would just be more complicated; we would have to use conversion tables and that would be difficult to handle"				
Agree	72	64	49	33
Disagree	15	29	49	65
Don't know	13	7	2	2
Total	100	100	100	100
"It would be too costly to change over our household measuring devices"				
Agree	63	52	38	22
Disagree	24	43	58	76
Don't know	13	5	4	2
Total	100	100	100	100
"It would be expensive for business to change their measuring equipment"				
Agree	80	83	70	69
Disagree	8	11	24	25
Don't know	12	6	6	6
Total	100	100	100	100
Number of cases	(560)	(419)	(243)	(175)

Table 12. Relation Between Some Components of Index of Receptivity and Level of Information Concerning the Metric System

(Percent distribution)

	Score on index of information					
	0	1	2	3	4	5
"The U.S. should make the change because the rest of the world uses the metric system"						
Agree	16	25	43	54	65	74
Disagree	66	69	56	46	34	21
Don't know	18	6	1	0	1	5
Total	100	100	100	100	100	100
"Shopping and price comparisons would be easier because the metric system can be divided or multiplied by 10"						
Agree	25	41	56	68	78	88
Disagree	42	44	37	29	19	10
Don't know	33	15	7	3	3	2
Total	100	100	100	100	100	100
"The metric system would be easier than our present system for our children to learn"						
Agree	33	49	65	74	90	86
Disagree	27	26	19	16	6	19
Don't know	40	25	16	10	4	5
Total	100	100	100	100	100	100
"Life would just be more complicated; we would have to use conversion tables and that would be difficult to handle"						
Agree	74	72	57	44	29	17
Disagree	10	21	40	54	69	83
Don't know	16	7	3	2	2	0
Total	100	100	100	100	100	100
"It would be too costly to change over our household measuring devices"						
Agree	69	57	42	33	21	19
Disagree	16	36	54	65	77	81
Don't know	15	7	4	2	2	0
Total	100	100	100	100	100	100
"It would be expensive for business to change their measuring equipment"						
Agree	80	83	77	74	66	71
Disagree	5	11	17	23	29	26
Don't know	15	6	6	3	5	0
Total	100	100	100	100	100	100
Number of cases	(418)	(399)	(217)	(199)	(127)	(42)

specific inquiry "Would you be willing to attend a course to learn the new measures?"

The distribution of the replies to the initial question is presented in table 13. A large number of respondents recognized the need for a diversified educational program; almost 40 percent of respondents mentioned at least two methods that should be employed. It was decided that persons mentioning three or more methods of educating the people were suggesting the use of all forms of public communication and thus not indicating any personal choice. Therefore, the analysis which follows was restricted to the preferences of respondents specifying only one or two media.

The most popular means of education indicated was the use of television instruction; 46 percent of respondents mentioned this as the preferred method. Interestingly, persons with higher educational attainment were somewhat more likely to mention television. This might, however, reflect awareness of the reach of television as compared with other media and not a personal preference.

Adult education courses, instructional leaflets, and newspapers were each mentioned by less than 20 percent of the respondents. There were hardly any systematic differences in the frequency of mention of these methods among demographic subgroups. However, persons knowledgeable about metric measures and those with more formal education were less likely to indicate a preference for adult education courses. In contrast, the relationship between willingness to attend a course to learn metric measures and both education and information level was reversed. Increasing knowledge about the metric system was associated with increased willingness to attend a course except among persons at the top of the information scale who perhaps did not perceive a personal need for formal instruction in metric measurement. Persons with less than a high school degree expressed less willingness to attend a course than respondents with more formal education (table 14).

Finally, some difference in willingness to attend a course was discernable for persons of different age and sex (table 14). Males more frequently said

Table 13. Preferred Methods of Educating the Public About the Metric System

	Percent of respondents
Television	46
Adult education courses	19
Instructional leaflets	14
Newspapers	18
Education of children	2
Mention of three or more methods needed	17
Other	2
Don't know	3
	([a])

---

[a] Total is greater than 100 percent since some respondents mentioned two types of media.

Table 14. Degree of Willingness to Attend a Course to Learn Metric Measures

(Percent distribution)

	Willing to attend course	Maybe, possibly	Not willing to attend course	Don't know	Total
All respondents	50	13	34	3	100
Age in years:					
Under 25	63	12	22	3	100
25–34	58	14	25	3	100
35–44	60	13	25	2	100
45–54	52	15	31	2	100
55–64	45	17	35	3	100
65 or older	25	10	60	5	100
Education:					
0–11 grades	39	14	41	6	100
12 grades	55	14	29	2	100
Some college, no degree	61	13	24	2	100
College degree	54	10	35	1	100
Sex of Respondent:					
Male	52	13	33	2	100
Female	44	15	35	6	100
Index of information about the metric system:					
0	35	15	44	6	100
1	51	14	33	2	100
2	61	12	24	3	100
3	62	15	22	1	100
4	54	10	34	2	100
5	50	5	45	0	100

they would attend a course to learn the new measures than did females. There was a tendency for age to correlate negatively with willingness to attend a course on metric measures; however, the relationship was not consistent and the only marked difference was in the small number of positive responses among persons over age 65.

EXPERIENCES WITH THE METRIC SYSTEM

Some insight into the types of problems the consumer might encounter should the United States adopt the metric system may be gained from an inquiry of persons who have had to temporarily adjust to the metric system. Therefore, persons who have lived or traveled extensively in metric-using countries were asked about their experiences in dealing with metric measurements.

Sixteen percent of the respondents (excluding persons who grew up in countries which use metric measures) indicated that they had used a different measuring system while living or traveling abroad and 17 percent of these persons mentioned problems in adjusting. However, there was evidence that many respondents were recalling their experiences with different monetary units rather than with units of the metric system. Therefore, no conclusions may be made concerning the relative ease of adjustment among persons who have dealt with the metric system and discussion must focus on the responses of the 3 percent of the total sample who spoke of problems in adjusting to measures other than monetary measures.

Among persons reporting difficulty in adapting to metric measurement (there were 41 such persons), 11 persons mentioned driving as a specific problem, nine persons reported difficulty in shopping, seven others mentioned problems associated with both shopping and driving, five responded "everything," and nine persons indicated they experienced difficulty in dealing with metric measures but were unable to identify specific problem areas.

In order to convey a qualitative picture of some of the problems which were encountered, a few cases are summarized below. It should be emphasized that these cases are typical only of those few people who spoke of problems in adjusting to the metric system.

A 41-year-old male with a college degree: "I never understood it; particularly difficult in using road maps and road signs."

A 76-year-old male with eight grades of schooling: "I had difficulty while driving and even trying to buy any little necessity. It was awful!"

A 35-year-old female with a college degree: "Just a nuisance – you had to break out a chart or guess."

A 46-year-old female, high school graduate: "I had to carry a book and look everything up."

A 73-year-old male with a college degree: "We always had to ask someone to help us."

A 60-year-old female, college graduate: "It was confusing at first but just a matter of learning the measures."

SURVEY METHODS

Data for the analysis of the population's information and attitudes concerning the metric system of measure was collected during the October – November consumer attitudes survey, a quarterly survey conducted by the Survey Research Center. Information was obtained from personal interviews with 1,402 families.

The samples of the Survey Research Center represent cross-sections of the population living in private households in the United States, excluding Alaska and Hawaii. Transients, residents of institutions, and persons living on military bases are not included. The method known as multistage area probability sampling is used to select a sample of dwelling units representative of the nation. First, 74 primary sampling units (each composed of a county or groups of counties) are selected: 12 of the largest metropolitan areas are selected with certainty, and 62 other sampling units are selected by probability methods from among all remaining counties in the coterminous United States.

In each primary sampling unit three of six secondary selections of cities, towns, census tracts or rural areas are made. In the third stage of sampling, urban blocks or small portions (blocks) of rural areas are chosen. For each survey, a new sample of dwelling units, in clusters of about four, is drawn from the block selections.

The basic unit for sampling is the dwelling unit, and for interviewing, the family unit. A family unit is defined as all persons living in the same dwelling unit who are related to each other by blood, marriage, or adoption. A single person who is unrelated to the other occupants of the dwelling, or who lives alone, is a family unit by himself. In some dwelling units, there are two or even several family units.

The head of the family unit is designated as the respondent. Five visits, and in some cases more, are made at different times in the day at dwelling units at which no one has been found at home. If a designated respondent refuses to give relevant information, a letter is sent urging him to reconsider. The letter is followed by another visit.

The Survey Research Center maintains a nationwide staff of interviewers, selected and trained by a staff of traveling supervisors. The interviewers are instructed in the careful and uniform use of the fixed-question open-answer technique. They pay particular attention to the establishment of rapport with respondents. Many questions are answered in the respondent's own words, which the interviewers record verbatim (or as nearly verbatim as possible). Nondirective probes are used to clarify the answers received.

Properly conducted sample interview surveys yield useful estimates, but they do not yield exact values. Errors may arise from several sources: sampling, nonresponse, reporting and processing. Each source of error must be considered in evaluating the accuracy of survey information.

Sampling errors arise in surveys because only a fraction of the population is interviewed. The sampling error depends on the magnitude of the reported percentage and on the size of the sample (or the number of respondents in the particular subgroup used).

Sampling errors are presented in two ways: first, as they relate to survey findings (table 15); second, as they relate to differences in survey findings

Table 15. Approximate Sampling Errors[a] of Survey Findings

(Sampling error in percent, by size of sample or subgroup)

Reported percentages	Number of interviews					
	2000	1000	700	500	300	100
50	3	4	5	6	8	14
30 or 70	3	4	5	6	7	13
20 or 80	2	4	4	5	6	11
10 or 90	2	3	3	4	5	8
5 or 95	1	2	2	3	4	—

[a] The chances are 95 in 100 that the value being estimated lies within a range equal to the reported percentage plus or minus the number of percentage points shown.

(table 16). Sampling errors are not a measure of the actual errors involved in specific survey measurements. They mean that, except for nonsampling errors, errors greater than those shown in table 15 or differences larger than those found in table 16 will occur by chance in only five cases out of a hundred.

Nonresponse errors arise because some persons selected for the samples refuse to be interviewed, are not at home after repeated callbacks, are ill or do not speak English. The response rate for this survey was approximately 81 percent.

Reporting errors—due to misunderstanding of questions or answers, lack of interest by the respondent, or intentional falsification—are kept at a minimum by careful training of interviewers, by attempting to gain the confidence and cooperation of the respondent so that he will answer to the best of his ability, and by watching for inconsistencies in the process of coding and analysis. Because answers are influenced by the wording of questions, conclusions based on answers to a single question are less reliable than those emerging from answers to several questions or from the interrelationship of answers to several questions.

Table 16. Sampling Errors of Differences[a]

(Differences required for significance, in percent)

Size of group	Size of group				
	1000	700	500	300	200
	For percentages from 35 to 65 percent				
1,000	6	7	8	9	11
700		8	8	10	11
500			9	10	12
300				11	13
200					14
	For percentages around 20 and 80 percent				
1,000	5	6	6	7	8
700		6	7	8	9
500			7	8	9
300				9	10
200					11
	For percentages around 10 and 90 percent				
1,000	4	4	5	6	6
700		4	5	6	7
500			5	6	7
300				7	8
	For percentages around 5 and 95 percent				
1,000	3	3	3	4	5
700		3	4	4	5
500			4	4	5
300				5	6

[a] Differences required for significance (95 percent probability) in comparison of percentages derived from two different subgroups of the same survey.

QUESTIONNAIRE AND SUMMARY OF RESPONSES

The distributions of answers to all questions concerning the metric system asked of the national sample respondents are given in this section, in the order in which the questions were asked.

Some questions were asked only of an appropriate subsample, but the percentages given are always of the total national sample. Where the appropriate subgroup is less than one-half the total sample, percentages are carried to one-tenth of a percent. Where the subgroup is greater than one-half the sample, percentages are rounded to the nearest percent.

	Percent of respondents
1. Have you ever heard of the metric system?	
Yes	70
No	30
	100
2. Could you tell me the names of some measures in the metric system?	
Meter, millimeter, centimeter, kilometer, other prefix with meter	23
Gram, milligram, centigram, kilogram, other prefix with gram	1
Liter, milliliter, centiliter, kiloliter, other prefix with liter	1
Two of the above	13
Three of the above	4
Incorrect response, don't know	28
Not asked this question, never heard of Metric System	30
	100
3. Do you happen to know how the metric measures relate to each other? For example: How many centimeters are in a meter?	
One-hundred	17.9
Incorrect response, don't know	23.5
Not ascertained	0.2
Not asked this question, never heard of Metric or unable to name measures	58.4
	100.0
4. Do you happen to know the relation of any metric measures to our customary measures? For example: About how many kilometers are in a mile?	
1 kilometer = 5/8 or 6/10 of a mile or 1 mile = 1.6 kilometers	3.9
1 kilometer = 1/2 or 2/3 of a mile or 1 mile = 1.5 or 1.7–2 kilometers	3.1
Incorrect response, don't know	34.4
Not ascertained	0.2
Not asked this question, never heard of Metric or unable to name measures	58.4
	100.0
5. Thinking about our customary system, can you tell me: How many pints are in a quart? How many inches in a yard?	
One correct response	15
Two correct responses	82
No correct response	3
	100

	Percent of respondents
6. Have you as an adult, ever lived or traveled extensively in a foreign country, other than the British Commonwealth countries, where you had to deal with a different measuring system than ours?	
Yes	17
No	83
	100
7. Did you have any problems in adjusting to the measuring system? (I do not mean problems with money.)	
Yes	3.2
No	13.6
Don't know, not ascertained	0.2
Not asked this question	83.0
	100.0
8. Did you have problems while driving, shopping, working, or what?	
Driving	0.8
Shopping	0.7
Working	0.0
Other	0.1
Everything, more than one mentioned	1.0
Not ascertained	0.6
Not asked this question	96.8
	100.0
9. Suppose speed limits were posted as say 80 kilometers an hour instead of 50 miles an hour. Do you think the American people as a whole would adjust fairly easily or with considerable difficulty?	
Fairly easily	20
With considerable difficulty	74
Don't know, not ascertained	6
	100
10. Do you think the American people as a whole would adjust fairly easily or with considerable difficulty to having the temperature reported as zero degrees centigrade instead of 32 degrees Fahrenheit?	
Fairly easily	29
With considerable difficulty	64
Don't know, not ascertained	7
	100
11. Do you think that it would be a good idea or a bad idea for the United States to change to the metric system of measure?	
Good idea	25
Pro-con	4
Bad idea	59
Don't know	12
	100

	Percent of respondents
12. Why do you say that?	
Rest of world uses metric	15
Metric decimal easier; U.S. system outdated	14
Customary system good; we're used to it	23
Cost reference (cost of change to households, business; taxes)	6
Age reference (hard for old; easy for young)	11
Change would be inconvenient, difficult	33
Other	3
Don't know, not ascertained	11
	([a])
13. Suppose the United States decided to change to the metric system. What do you think would be the best way to help people to learn the new system? Do you think it would be better to use TV instructions, adult education courses, instructional leaflets, newspapers or what.	
TV	46
Adult education courses	19
Children's education	2
Instructional leaflets	14
Newspapers	17
Other	2
Everything, more than 2 responses	16
Don't know, not ascertained	3
	([a])
14. Would you be willing to attend a course to learn the new measures?	
Yes	50
Maybe, possibly	13
No	34
Don't know, not ascertained	3
	100
Now I'm going to read you reasons some people have given in favor of a change to the Metric system. Would you tell me if you agree or disagree with each opinion.	
15. The United States should make the change because the rest of the world uses the metric system.	
Agree	34
Disagree	58
Don't know	7
Not ascertained	1
	100
16. Shopping and price comparisons would be easier because the metric system can be divided or multiplied by 10.	
Agree	47
Disagree	37
Don't know	15
Not ascertained	1
	100

---

[a] Adds to more than 100 percent because some respondents gave more than one answer.

	Percent of respondents
17. The metric system would be easier than our present system for our children to learn.	
Agree	55
Disagree	22
Don't know	23
	100

And here are the opinions of people who don't think the United States should change to the metric system. Tell me if you agree or disagree with these statements.

	Percent of respondents
18. Life would just be more complicated; we would have to use conversion tables and that would be difficult to handle.	
Agree	61
Disagree	31
Don't know	7
Not ascertained	1
	100
19. It would be too costly to change over our household measuring devices.	
Agree	50
Disagree	42
Don't know	7
Not ascertained	1
	100
20. It would be expensive for business to change their measuring equipment.	
Agree	78
Disagree	14
Don't know	8
	100
21. The rest of the world should change to our measuring system.	
Agree	12
Disagree	77
Don't know	11
	100

IV. SELECTED AREAS OF CONSUMER CONCERN

The papers contained in this chapter are those prepared by experts on areas of consumer concern. Most of the individuals were associated with universities and were in departments concerned with the activity assigned. Others were employed full time in occupations related to the activity. Consequently, all had a firm understanding of the present situation and with careful analysis could reasonably consider probable future effects of metrication on the selected area of consumer concern. In addition to their professional qualifications, many hold memberships in consumer organizations and have had extensive experience in working in areas of consumer interest.

PURCHASING PROCESSED FOODS

Jean A. Phillips

College of Home Economics, Virginia Polytechnic Institute and State University

INTRODUCTION

The English system (customary system) of weights and measures brought to this land by the colonists prior to the formation of the United States has been used since that time in trade and commerce, and has been retained essentially unchanged. Current legal restrictions are such that the customary or U.S. system of measure is presently used in retail markets for all foods, with metric units sometimes available as parenthetical information. Thus individual consumers are experienced with the customary system and use this for making judgments of quantity.

In general, home economists, who by definition are concerned with the well-being of families and individuals, would be a group of persons in the United States who are knowledgeable about current usage of measuring systems in purchasing processed foods. A survey [1] of representatives from the various areas within home economics indicated little current use of the metric system except by those home economists in government and public health research. Further, as far as it was possible to determine, no one person (or group) was familiar with and knowledgeable about the entire metric system of measurement units. Those home economists whose positions involved research in the physical and life sciences or who work in product development and marketing expressed greater familiarity with the metric system than did those who were less involved with actual need for precise measurements. The working knowledge was usually limited to the base units of the system as these applied to the area of specialization. Since home economists have an active part in consumer education at all levels, knowledge of the customary system apparently meets the personal and workday needs of these persons and negates any impact of the worldwide increase in the use of the metric system on our domestic situation.

This dearth of knowledge about and limited use of the metric system in our domestic food markets is probably due to reliance on the comfort of the familiar, i.e. the customary system, as well as on legal requirements for units of measure used for processed food products. Some products are labeled with customary and metric units of measure and may have been packaged in other countries for market in our retail food stores, or may reflect similar practices by processors in the U.S. who market food products in countries that use the metric system as official measure.

Other rationale for a lack of utilization of the metric system in retail food markets in the U.S. is presented later in this paper.

EXISTING LABELING REGULATIONS AND MARKET PRACTICES

The Declaration of Policy in the Fair Packaging and Labeling Act (Public Law 89-755, November 3, 1966) states:

> Informed consumers are essential to the fair and efficient functioning of a free market economy. Packages and their labels should enable consumers to obtain accurate information as to the quantity of the contents and should facilitate value comparisons. Therefore, it is hereby declared to be the policy of the Congress to assist consumers and manufacturers in reaching these goals in the marketing of consumer goods.

Elucidation of this "accurate information" as to contents is spelled out in section 4 of the Act which provides in addition to the identity of a commodity the requirement that "the net quantity of contents (in terms of weight, measure, or numerical count) shall be separately and accurately stated." For those packages which contain less than 4 pounds or 1 gallon, the weight or measure shall be expressed both in ounces (with identification as to avoirdupois or fluid ounces) and if applicable, in pounds for weight units, with any remainder in terms of ounces or common or decimal fractions of the pound; or in the case of liquid measure, in the largest whole unit (quarts and pints, or pints as appropriate) with any remainder in terms of fluid ounces or common or decimal fractions of the pint or quart. It is interesting to note here the inclusion of the base 10 or decimal units with the customary system.

The regulations for the enforcement of the FPL Act, (Part 1, Title 21 Code of Federal Regulations as amended July 21, 1967, and September 20, 1967, effective December 31, 1967, and July 1, 1968), 1.8b (a) state that the net contents declared on labels for food products shall be:

> in terms of fluid measure if the food is liquid, or in terms of weight if the food is solid, semisolid, or viscous, or a mixture of solid and liquid. . . If there is a firmly established general consumer usage and trade custom of declaring the content of a liquid by weight, or a solid, semisolid, or viscous product by fluid measure, it may be used. Whenever the Commissioner determines that an existing practice of declaring net quantity of contents by weight, measure, numerical count, or a combination in the specific packaged food does not facilitate value comparisons by consumers and offers opportunity for consumer confusion, he will by regulation designate the appropriate term or terms to be used for such commodity.

Subparagraph (b) of 1.8b designates weight in terms of the avoirdupois pound and ounce, and fluid measure in terms of the U.S. gallon, quart, pint, and fluid ounce. Dry measures are designated as the U.S. bushel, peck, dry quart, and dry pint. Provision is again made for the use of common fractions (halves, quarters, eighths, etc.) and of decimal fractions.

It is easy to see from the above regulations that careful attention is needed on the part of consumers to avoid confusion between weight and volume when the term ounce is used, and the qualifying term avoirdupois or fluid are essential for clarity. The dry quart and pint are less frequently used which helps to eliminate some confusion from ambiguity. Allowance of sub-units as common fractions or as decimal fractions compounds possible confusion.

In order to provide a basis for discussion of the utilization of these measures a limited survey was made of all processed foods in one retail outlet of a national chain food store. Some of the findings of major food items are summarized in table 1. This survey indicated that the regulations for expres-

Table 1. Net Contents as Listed on Labels for Some Processed Foods*

Categories	Items	Avoirdupois			Metric		Count	Total yield or servings
		Wt. (oz.) Percent	*Vol. (fl. oz.) Percent*	*Measure (gal-qt-pt) Percent*	*Wt. Percent*	*Vol. Percent*	*Percent*	*Percent*
Dairy Products—								
Milks, fresh fluid	13			100.00				
Milks, canned	7	100.0	71.4					
Cheese	40	100.0			10.0		17.5	
Frozen desserts	57	7.0	21.1	71.9			19.3	3.5
Canned—								
Fruits	70	100.0			8.6		4.3	11.4
Fruit juices	109		98.2	1.8		2.8		7.3
Meat, fish, poultry	64	100.0			10.9			3.1
Vegetables	17	100.0			35.3		5.9	11.8
Soups	18	100.0			33.3			61.0
Mexican foods	26	100.0			69.2			3.8
Frozen—								
Fruits	4	100.0						
Meat, fish, poultry	46	100.0					30.4	
Vegetables	62	100.0						
Baked goods	24	100.0					58.3	
Dehydrated—Fruits	16	100.0			50.0			6.2
Sweeteners—								
Artificial	8		100.0			3.8	12.5	
Sirups	11	36.4	63.6	9.1				
Sugars	8	100.0			12.5		12.5	
Miscellaneous—								
Cookies-crackers	84	100.0			47.6			
Herbs-spices	98	100.0			30.6			
Sauce mixes	42	100.0			14.3			52.3
Rice & rice mix	26	100.0			11.5			34.6
Baking powder	6	100.0			50.0			
Instant coffee	9	100.0			88.8			

* Survey in one retail outlet.

sion of quantity were followed by food processors with the exception of weights expressed in ounces. Often the qualifying term avoirdupois (av.) was omitted for solid and semisolid foods. These are listed in the table as weight measure because of the nature of the food item. This omission of the qualifying term is probably due to allowances for using labels printed prior to the activation date of the regulations. One very confusing category was sirups, which were labeled in volume units or fluid ounces (63.6%) and in mass units or avoirdupois ounces (36.4%). Viscosity of the product or common trade usage may account for the decision to label in mass or in volume units; whatever the reason, the fact remains that this practice seems confusing for the consumer.

All items were found to have expression of measure as required, with supplementary measure in metric units for some. These categories of food items which included metric information on more than 25 percent of the labels were for food produced under one brand name in each category, indicating that some food processors are either marketing under the same brand name in other countries or are interested in expanded metrication in the United States. Those labels for processed foods which included metric units on more than 50 percent of the labels were for foods which are popular with Spanish-speaking Americans who are probably more familiar with the metric system than with the customary system.

To lessen confusion for individual consumers it seems that yield (either total or as numbers of portions, if portion size is stated) should be of benefit. However, this information was provided on few items, and most of these were items which change in volume due to cooking or required dilution before serving. Personal conversation with consumers revealed that many purchasers select processed food by visual examination of the container size rather than close attention to weight or volume measure. This would indicate that experienced consumers have empirical knowledge of the appropriate size to purchase in order to adequately feed a group, family or individual. These consumers reported that careful reading of label detail (unit of measure) was practiced only when comparing a new product with a familiar one or when a thrift campaign was initiated. On this basis attention should be given to container sizes.

Frozen foods are packaged in relatively standardized boxes, cans, plastic bags and bowls. All of the frozen foods are sold by customary weight or volume units; however, not all frozen food items are packaged in the same weight or volume units since there is variation in density of these food items, and portion size is more desired than portion weight. For example, similarly sized containers may contain: 5 oz. onion rings, 8 or 9 oz. green beans, 10 oz. corn, 8 or 10 oz. lima beans, 10 oz. broccoli, or 12 oz. seasoned cooked rice.

Heat processed foods are usually packaged in metal (tin or aluminum) or in glass jars. In 1949 a list of 32 can sizes, with can name, dimensions and probable products, was promulgated by the National Bureau of Standards in an effort to simplify selection. These can sizes are known by a variety of numerical, letter, or word designations, or a combination of these. Since then there have been more variations in container sizes utilized, and 20 of these "newer" can sizes are commonly found in retail markets. Some recipes use can sizes of frequently used containers as measures of ingredients; thus, consumers need to be knowledgeable about the identity of some can sizes.

The 53d edition (1969) of The Almanac of the Canning, Freezing and Preserving Industries [2] reports:

> According to well-established can manufacturing practice, both the diameter and the height of containers are described by three digits. The first or left-hand digit gives the number of whole inches. The next two digits give the additional fraction of the dimension expressed as sixteenths of an inch. The first three digits always represent the diameter of the can, while the last three digits give the height of the can. The dimensions of the No. 303 can, for example, are expressed as 303×406. This means that the can is $3^{3}/_{16}''$ in diameter and $4^{6}/_{16}''$ in height. Each dimension is "overall" with the diameter being measured to the outside edge of both double seams and the height being measured to include the distance between the outside edge of both terminal seams.
>
> Glass containers are also identified by the same terms of reference used for cans. For example, the specifications of 303×411 identify a No. 303 jar that has a diameter of $3^{3}/_{16}''$ and a height of $4^{11}/_{16}''$ within manufacturing tolerances. Glass jars of unusual shape and form are frequently identified by the net quantity in terms of avoirdupois pounds and ounces for mixtures of solids and liquids or in terms of U.S. fluid gallons, quarts, pints, and ounces for juices and other all-fluid products.

Probably few people know the meaning behind the term 303 can, or the appropriate weight for food items packaged and processed in a No. 303 can; however, most consumers will quickly learn the number of servings available in this and other containers.

The use of numerical count as a measure of quantity is limited to some foods which are marketed in discrete pieces. Two examples of count *vs.* weight or volume are frozen dessert products and bakery goods. Ice cream packaged in bulk containers (gallons, quarts and pints) are labeled in terms of liquid measure in the frozen state; however, confections individually wrapped (Popsicles, Eskimo Pies, etc.) are labeled by count with liquid measure in fluid ounces as supplementary information. Bakery goods are marketed by weight, (pounds and ounces) when sold as one unit for division by the consumer and by count when the items (e.g. rolls, biscuits, cookies) are predivided by the producer. There seems always to be an exception in the food market and in bakery items; this exception is sliced bread which is sold by weight. This is probably due to the fact that bread was customarily sold by weight of unsliced loaf and the practice of preslicing for convenience is comparatively recent.

Convenience items such as mixes for cakes, puddings, flavored gelatin and specialty foods are marketed in customary units, although for any one category there is variation in quantity per package. The consumer is interested in total yield, not in quantity per package, and therefore is more interested in the fact that cakes of equal volume may result from packaged mixes with weights of 19 or 20 ounces. Similarly flavored gelatin (3 oz. box) and unflavored gelatin (4 packages/1 oz. box) will yield 4 and 16 servings respectively when hydrated and formulated in the home into a salad or dessert.

Paper goods for individuals which are commonly sold in grocery stores are labeled by count, with supplementary information about (1) dimension for flat items such as napkins, towels and tissues, and (2) volume capacity for cups and containers. Wrapping materials (waxed paper, foil, plastic wrappings) are prominently labeled according to length, and less prominently according to width and total area. All of these measures – dimension, length, area, and volume are in the units of the customary system.

The present status of quantity indicators for processed food and paper items in the United States today is complete use of the customary system of measuring units (with the ambiguities of the unit terms ounce, quart, and pint) and with supplementary use of metric units for a small number of items. These units, customary or metric, serve as bases for trade regulation and to a limited extent for comparison by individual shoppers. It is much more likely that individuals use empirical knowledge of brand name and/or container appearance rather than net contents in weight or volume in making selections to provide an adequate quantity of food items. Storage facilities for excess or "leftovers" would of course be a factor in the purchase or no-purchase decision, but neither storage facilities nor precise units are as likely to be as important as is total yield or number of portions.

POSSIBLE CHANGES

Current trends in the food market indicate that the quantity of processed foods consumed per individual will increase with a corresponding decrease in use of fresh foods. Processing of foods includes packaging for protection of the item, which in turn establishes a need for some system of indicating quantity per package. Under the free enterprise system any increase in metrication would be dependent on: (1) utilization of one label for products marketed both in the United States and in other countries by producers involved internationally, and (2) inclusion of supplementary metric units by processors who are interested in furthering the use of metric units, (3) persuasive forces of competition or consumer demand, and/or (4) changes in the Code of Federal Regulations.

Those processors in other countries who export food to the United States must comply with U.S. regulations, and as long as current regulations are in force there may be pressure to change our system, but not compulsion. The many varieties of domestic processed foods available to consumers in sufficient quantities to satisfy hunger and provide nourishment will preclude coercion from the current world metrication for a change in the units of measure in our markets. This may not be true for those markets along the land boundaries which may use a dual labeling system.

ADVANTAGES FROM INCREASED METRICATION

A planned program of metrication would surely benefit consumers since this would aid in eliminating present ambiguities. The different terminology for the metric units designating mass, volume, and length coupled with the ease of arithmetic computation in decimal units should facilitate food shopping for processed foods. The fact that metric units of measure are comparable to the existing U.S. monetary system may simplify the change for some, although understanding of the system should not prove insurmountable, particularly with consumer education as an integral part of the change.

Much has been accomplished with recent legislation to eliminate qualifying adjectives such as a "large" gallon or a "super" quart; however, conversion to the metric system for mass and volume measure in retail food markets would further aid consumers. Metrication would eliminate the varied (and confusing) subunits such as 16 avoirdupois ounces/pound and 32 fluid ounces/quart, and facilitate arithmetic calculations needed for price comparisons.

Little effect would be noticed in the processed foods market as a result of measure for distance from inches, feet, or yards to centimeter, decimeter, and meter, for no foods are presently marketed by distance or length (except for "foot-long" hot dogs). Change in unit of measure for distance or length would affect only food wrapping materials such as waxed paper, foil, etc.

DISADVANTAGES FROM INCREASED METRICATION

Two disadvantages may result from a change in the measuring system. One of these would be the need to educate consumers in metric equivalents to our customary system. However, this would not seem to be a monumental task. The simple procedure of dual labeling over a period of time should serve the purpose of solid and semisolid processed foods quantitized by weight. Placing metric units subsidiary to customary units for a period of time, then reversing the order and size would be one means of education by subtle infusion. The other disadvantage may occur as a possible change in container size for fluid materials (fresh milks, vinegars, oils, sirups). Liquid processed foods, particularly fluid milks, would require some change in sizes of containers with attendant changed labeling and need for understanding by the consumer. This change in milk packaging could prove to be a benefit from a nutritional standpoint since one-fourth and one-half liter will yield slightly more than the currently used half-pint and pint. If height of any container is crucial for filling machinery this dimension could be kept constant, and variation made in diameter or cross-sectional size.

SUMMARY

The advantages of metrication, more easily interpreting labeling of quantities with simplified arithmetic for comparison shopping certainly are of greater significance than the disadvantages.

As a part of consumer education, conversion charts listing appropriate increments in weight, volume, length or distance and temperature would be needed. These charts may be mailed to those people on the Internal Revenue mailing list, made available in post offices, and distributed through the public schools.

REFERENCES

[1] Report of the Consumer Interests Committee on the Effect on Consumers if United States Adopted the Metric System, American Home Economics Association, (June 1970).

[2] The Almanac of the Canning, Freezing, Preserving Industries, (Edward E. Judge and Sons, Westminster, Md., 1969) p. 110.

PURCHASING FRESH FOODS

Marjorie M. Merchant

Extension Management and Family Economics, University of Massachusetts

INTRODUCTION

This paper covers the consumer activity of purchasing fresh foods in retail food markets. Retail food market in this report refers to retail stores which offer food for sale to consumers and includes self-service supermarkets, both chain and independent operations; small owner-manager food stores; specialty stores (i.e. fish markets); and roadside markets.

The term *fresh foods* in this report refers to food sold in retail markets in the fresh form. Fresh red meats, fish, poultry, eggs, fruits and vegetables are included.

The information was obtained in several ways. Personal knowledge and experience in working in the area of food marketing was supplemented by library research. The original draft of the report was reviewed by personnel employed in consumer education in nutrition and foods. The report used data from 158 questionnaires, on the impact of a change to the metric system on consumers, completed by home economists in various educational, research and business positions. This data related principally to the possible future effects of planned metrication on consumers.

PRESENT CONSUMER PURCHASES BASED ON CUSTOMARY UNITS

Purchasing fresh foods in United States retail food markets has not been influenced to any significant degree by worldwide or domestic metrication. Even when the fresh products are imported from a country whose measurement system is metric, they are purchased in this country in customary units.

This is readily understood from the fact that fresh meats, fruits and vegetables are not usually imported in consumer size units. The breakdown into consumer units for retail sale is performed in this country, and conforms to the customary system.

Approximately 96 percent of livestock food commodities and 89 percent of crop food commodities sold in this country are from domestic production [1]. The United States production and distribution of fresh meats, fruits and vegetables are based on customary units of measurement. Thus, there is no significant influence of the metric system from imports.

Fresh red meats, poultry, and most fresh fish are sold by the pound. However, some fresh fish, especially shellfish, are measured by volume, i.e. shucked oysters are usually sold by the quart.

Market classification of poultry relies in part on weight ranges in pounds.

For example, ready-to-cook chickens weighing between 1¼ to 2½ pounds are classified as broilers; between 2½ to 4¾ pounds as roasters; and stewing hens usually range between 2½ to 5½ pounds. Similar weight ranges in pounds are used for the market classifications of turkey.

The consumer has the advantage, in purchasing fresh meats, fish and poultry, of a fairly consistent measurement base. Comparison of cost and utilization can be easily made where all the consumer size offerings are in units based upon the pound. Such uniformity is not present among many other food products, and especially not among the retail market offerings of fresh fruits and vegetables.

Units based upon the pound for fresh meats, fish and poultry are consistent with recipe standards and cooking temperatures and times used in this country. As more processed meat, fish and poultry items arrive in retail food markets in units based upon the kilogram, comparison between the fresh item and the processed selection could conceivably be confusing and difficult for consumers without dual labeling or complete reliance on metric units.

There is a current trend toward simplification of the customary unit used in purchasing fresh meats, fish and poultry by expressing fractional parts in decimal fractions. This simplification is used especially in the self-service retail food industry. Decimal fractions of the pound are also being applied to packaged fresh produce.

Eggs are sold by count, based on a dozen, and size, based on weight classes. There are six U.S. weight classes for eggs based on the minimum weight of a dozen eggs. These are Jumbo, 30 ounces; Extra Large, 27 ounces, Large, 24 ounces; Medium, 21 ounces; Small, 18 ounces; and Peewee, 15 ounces.

One can question whether consumer purchases of eggs are related to knowing the weight classes, or rather to size, appearance, and individual preference. If size, appearance and preference are the consumer's guide to selection of eggs, then the measurement base could be either customary or metric without a direct impact on the consumer.

Many fresh fruits and vegetables are offered in retail food markets by customary units based on the pound. In the self-service supermarket, consumer-size packages containing one pound or multiples of one pound are commonly used for such fruits as oranges, grapefruit, and apples and for vegetables such as carrots, potatoes, and onions. In other instances, the fresh produce item is packaged in fractional units based on the pound. In smaller food markets, consumer-size packages may not be used; however, such fresh product items, unpackaged, are still sold by a customary unit based upon the pound.

Fresh produce selections offered in units based on the pound and priced by the unit provide consumers with the opportunity to make price comparisons. However, such price comparisons can only be realistic if quality is consistent. There is very little consumer grade-marked produce available in retail markets, though 13 U.S. consumer grades have been developed (as of January 1970). Selling by grade, using U.S. trading grades, is more common with producers and wholesalers than with retail merchants. Therefore, though retail selling by units based on the pound offers the advantage of price comparisons, the success of such comparison is dependent to a large degree on the ability of individual consumers to judge quality.

Selling by measure, using units based on the bushel, is still practiced in some markets, especially for items such as apples and potatoes. This unit of measurement is more likely to be found at local markets adjacent to growing areas during the harvest season. This method of selling fresh produce permits pricing discrepancy, as equal volumes of the same item will not weigh the same, due to the differences in size, shape and density of the product. However, this form of selling is limited in scope, and in most instances the pricing disadvantages to consumers are offset by individual consumer preference for local produce in bulk containers.

Selected fresh produce may be sold in retail food markets by the individual unit, such as head or melon. For example, lettuce or cabbage heads are often sold at a price per head, irrespective of variations in quality and size. This form of merchandising produce eliminates any opportunity for consumers to make meaningful cost comparisons. In addition, it discriminates among buyers; one buyer can obtain more of a product at a specific price than another buyer in the same market at the same time.

Not all markets use this form of selling such items as lettuce. In many instances, this type of produce is sold by the pound. If unit pricing based on weight were adopted for food products in all sections of the country, it is conceivable that selling by the individual item, such as head, would be significantly curtailed.

Number or count continues to be a familiar measure for merchandising some fruits and vegetables, not only at the retail level, but also, from the producing area through the distribution system. Asparagus, for example, is usually sold by the bunch, with a range in number of stalks per bunch, dependent upon the size and/or grade classification and production area.

Consumer packages based on count have been used extensively for such fruits as grapefruit, oranges, plums, pears, lemons and nectarines. This type of food lends itself easily to merchandising and packaging by count. Pricing fruit and vegetables by count rather than by mass or volume prohibits meaningful cost comparisons. This method of selling fresh fruits and vegetables will not be affected by metrication in this country unless means are taken to eliminate this practice or insure that the additional information of price per unit of weight is also available to the consumer.

Small fruits and vegetables such as berries, cherries, brussel sprouts and cherry tomatoes, are usually available for sale in retail markets by measure based on the quart. The physical characteristics of these items lend themselves readily to this type of measurement. Measurement by volume for these selections, especially for berries, relates to consumer use and measurement in cooking.

It would be reasonable to assume that for purchases of fresh meat, fish and poultry, units based on the pound are understood and utilized to an appreciable extent by concerned consumers in determining amounts to buy and in price comparisons. The question here would appear to be one of consumer motivation and interest, not one of complexity and confusion relative to the unit of measurement.

The situation is not as straightforward among fresh fruit and vegetable selections, where there is a lack of uniformity in measurement units. There is no consistent measurement base among fresh fruit and vegetable offerings for meaningful consumer price comparisons.

CURRENT TRENDS IN RETAIL MARKETS

There is no current trend toward metrication in the purchasing of fresh food in retail markets. Assuming no Federal Government program to increase the use of the metric system, continued increasing worldwide and selected domestic use of metric measures would have little or no effect. It is unrealistic to assume a change in measurement units for consumer size offerings of agricultural commodities without a change throughout the distribution system of such products. The economic impact of metrication on U.S. livestock and crop production and distribution is of considerably less magnitude than for other domestic industries. The changes needed within the area of fresh foods would be for practical purposes negligible.

Thus, it is inconceivable that the consumer engaged in purchasing fresh foods will make selections among choices based on the metric system of measurement without a planned metrication program within the United States.

CHANGES AND EFFECTS OF METRICATION ON FRESH FOOD PURCHASES

If the United States changed to the predominant use of the metric system, the number of language, unit and size changes would be relatively minor for the consumer purchasing fresh foods. For fresh meats, fish and poultry, the principal change would be from units based on the pound to units based on the kilogram.

This change would involve language changes to gram and kilogram from the customary ounce and pound. In the conversion, there would be no size change if the change were to metric equivalents. For example, one pound of ground beef is equal to 454 grams or 0.45 kilograms.

There would be slight variations in the size of the unit of fresh meat, fish or poultry if the conversion was not to exact metric equivalents, but rather to metric units of easily calculated multiples of grams and decimal fractions of the kilogram. Such variations in size would be relatively insignificant, if the units developed adhered closely to the actual metric equivalent of the customary unit and were uniformly adopted.

The problem of size difference would exist in the transfer from the customary unit of the pound to the metric unit of the kilogram, especially in relation to the base unit for pricing. Pricing on the basis of the kilogram would require that consumers recognize that one kilogram represents 2.2 pounds.

In pricing consumer size packages of fresh foods, it would not be unrealistic to consider using the decimal fraction of the kilogram equivalent to the customary unit of the pound.

In fish products purchased by liquid measure the change would be one of language, from units based on the quart to units based on the liter. The size would be changed, as the liquid quart is 0.946 of a liter, and weight classes of eggs would remain the same in respect to the minimum amount of egg the consumer receives in each size designation, with conversion to metric equivalents. The unit of measurement would be based on the kilogram and the language change would be to grams per dozen.

The weight changes among fresh fruits and vegetables sold in units based on the pound would be similar to the changes in fresh meats. Conversion to the metric system would not affect items sold by count or individual unit, unless it became mandatory for all items to be sold by weight.

As retailing of fresh fruits and vegetables by measure, based on the bushel, is limited in the United States, conversion to the metric system would only affect certain local market situations. Under metric conversion there would be a change from a unit based on the bushel to a unit based on dekaliters, and a language change from pecks and bushels to liters and dekaliters. It is reasonable to assume that within a relatively short time, retailing by measure based on the bushel will have diminished appreciably—even at the local, seasonal markets. If this happens, conversion to the metric system would affect consumers only in relation to the standard for a unit of mass.

Small fruits and vegetables sold in pints and quarts would be affected principally as a language change. Consumer size units of these small produce items would be somewhat smaller, as the quart is equivalent to 1.10 liters in dry measure. However, even where containers might undergo slight dimensional changes as the result of rounding off linear measurements under conversion, size changes would be relatively insignificant.

Standards for the grading of fresh fruits and vegetables which contain size classifications, such as potatoes, would be affected by a language change under metrication, principally from inches to centimeters.

All change produces its transition period of confusion, concern and adjustment. Conversion to the metric system would require of consumers the learning of a new language. This relearning process would not be limited to speaking of kilograms, liters, centimeters, and millimeters, but even more demanding would be the need to base purchase decisions on these new language units.

The intensity of reaction to a change in the measurement system would be directly related to age, economic and educational factors. Young people working with metric language and units in school would not face the same difficulties as older consumers. It is to be expected that consumers from the lower economic and educational levels would be most confused. Even without a change in the measurement system, many of these consumers are operating at a disadvantage with the customary system.

Accepting the simplicity and logic of the metric system as one of the greatest advantages to consumers, changes could be initiated toward achieving the same advantage within the customary system. These could include the simplification of the customary unit by expressing parts of the unit in decimal fractions. As indicated earlier, this practice is being used in many parts of the country for fresh meats, fish and poultry. The extension of this practice to all fresh foods would be an advantage for consumers.

A change to the metric system would require extensive emphasis on consumer education. In a limited survey of home economists throughout the country, considerable concern was expressed by the respondents relative to consumer understanding and use of the customary system. They all agreed that U.S. consumers do not know or use the metric system. One of the first steps would be the re-education of the consumer educator in the new language and units. Of the 158 professional home economists surveyed, 44 percent indicated little or no familiarity with the metric system. In-service education programs would be necessary in many professional areas. Educational materials designed to meet a variety of consumer levels would be needed.

The market itself could serve as a communicator for consumer education. Point-of-sale information, such as a conversion chart, could help consumers at the time of decision. Market scales in the fresh fruit and vegetable area could display conversion information. In the case of prepackaged selections, such as the 3-pound bag of apples or the 5-pound bag of potatoes, dual labeling could be used during the transition period. Pocket and wallet size conversion charts could be available in food stores. Amount to buy information could be coupled with conversion factors, helping consumers to think in the new units.

The impact of conversion to the metric system on consumer purchases of fresh foods could be expected to be relatively minor. Where household scales are used with these foods, the consumer could easily convert weights with a conversion chart. Amount to buy charts in cookbooks could also be converted easily to metric language and units. A part of the consumer education effort would need to be directed toward helping consumers understand the ease with which current household equipment could be used with metric units and language.

REFERENCE

[1] National Food Situation, (Economic Research Service, U.S.D.A., August 1970).

FOOD PREPARATION – RECIPES AND THEIR CONVERSION

Fern E. Hunt and M. Eloise Green

School of Home Economics, Ohio State University

INTRODUCTION

Increasing worldwide use of the metric system of measurement has had little impact on home food preparation in the United States. Few women in this country know or use the metric system in food preparation at home. Among those who have read or heard that a conversion from the U.S. customary system to the metric system is under consideration here, few seem to have a clear idea of how it would affect them. There is some concern that a changeover would require discarding old favorite recipes and cookbooks, necessitate expensive replacement of measuring and cooking devices and utensils, and that learning a new system would be very difficult.

People who have immigrated to the United States from countries on the metric system have encountered some difficulty in adapting to our customary units of measurement for food preparation and in some cases have obtained measuring devices from their homeland to use instead of those customarily used here. On the other hand, U.S. citizens living or travelling abroad have reported no great difficulty in adjusting to the metric system. They have noted that European recipes list exact weights or volume measures or both but that European homes are not all equipped with accurate weighing and measuring devices. In fact, with good pastry shops in almost every urban neighborhood, kinds of cookery requiring careful measurement of ingredients are reportedly uncommon in European homes. To facilitate cooking, certain items such as baking powder are available in some countries in small preweighed packets.

The metric system or a combination of the metric system with the U.S. customary system is in common use in the United States in food and nutrition research, in dietetics, in food composition tables, and in scientific publications. Potencies of medicines and substances such as ascorbic acid, which is used in food preservation to prevent darkening of certain fruits in freezing, are stated in metric units. Quantities in both metric and U.S. customary units are marked on the containers of a number of food products, but many people are unaware of this.

Consumers experience no inconveniences or problems in the above-mentioned situations because the necessary information is provided for them by physicians, dietitians, nutritionists, and food specialists in terms the lay person can comprehend. Although information in metric units may appear on products, most people do not need to know or understand the metric system and may disregard the information.

In the present situation, there is no readily apparent advantage to the consumer in having information on quantity available in metric units, and no trend toward increasing use of the metric system in food preparation in U.S.

homes is evident. Continued worldwide expansion in use of the metric system is not likely to affect home food preparation methods in this country unless changes in other areas affecting consumers force the issue. If the homemaker finds herself required to know and use two systems of measurement—one for food preparation and another for dimensions for furnishings and equipment, for clothing sizes, and for quantities of gasoline and distance in use of the family automobile, for example, she is likely to become more interested in converting to one system completely—possibly the metric system.

QUANTITY MEASUREMENT IN HOME FOOD PREPARATION

PRESENT SITUATION

Recipes most commonly used in homes in the United States specify quantity of ingredients by volume based on the U.S. customary system of measurement. The volume measures used include the quart, cup, tablespoon and teaspoon units and fractions of these. The measuring cup, if graduated, bears markings in fourths and in thirds. In nested cup sets, common sizes are one, one-half, one-third, and one-fourth cup. Measuring spoons are usually sold in sets having one tablespoon, one teaspoon, one-half teaspoon and one-fourth teaspoon.

Capacity of the one-cup measure for both liquid and dry materials is established at 8 fluid ounces or 236.6 milliliters; for one tablespoon, 14.79 milliliters; and for one teaspoon, 4.93 milliliters [1]. Variation in capacity of standard measuring devices is limited by the standard to ±5 percent, but compliance of manufacturers with these standards for measuring devices is voluntary. Capacities of these measures are derived from the one-quart fluid measure.[1] One cup level full is equivalent to one-fourth quart and also to 16 level tablespoonfuls. One level tablespoon is equivalent to 3 teaspoonfuls.

Capacity of the one-cup measure was originally established in the Code of Specifications of the National Bureau of Standards prior to 1926 [2,3] and standards for tablespoon, teaspoon, and fractions of cup and teaspoon were adopted in 1926 [4]. According to information in early literature on standards for measuring equipment [2-6] considerable time elapsed between establishment of the government standard, production of reasonably accurate devices by manufacturers, and adoption of homemakers accustomed to estimating quantities by "breakfast cups" and "teacups."

In the United States, use of utensils and measuring devices standardized for capacity and/or dimensions has greatly facilitated food preparation and food information exchange. Standardization of measuring equipment has permitted establishment of basic proportions on the basis of volume for ingredients for various food items. Although considerable time was required for accomplishment of the present level of adoption of standardized measuring equipment in homes, women have become accustomed to using and relying upon these items in cooking.

---

[1] One quart, liquid measure equals 0.95 liter; one quart, dry measure equals 1.10 liters.

Most homemakers are familiar with the terminology of the currently used system of measurement by volume and recognize equipment of particular sizes. Some, however, may not be aware of the proportional relationship between cup and spoon volume measures and may have no real need to know this in the cooking that they do. Women know also the common units of weight (pounds and ounces), but few own or use scales or balances in actual preparation of food.

The accuracy with which women use their measuring devices is another matter and may be affected by such factors as training and experience in food preparation, personal standards, haste, and occasion for which the food is to be used. A number of women with whom we have spoken to about use of measuring devices said that they are likely to follow a new recipe as exactly as possible on the first few occasions of preparing food from it. When they have become familiar with the recipe and the product, they are then likely to speed up preparation by giving less care to the measurement—possibly even estimating quantities by eye or other means. Further, some women admit that if the food is for everyday consumption by the family, less attention may be given to preparation than if it is for a special occasion or purpose.

Considerable variability occurs in amounts of ingredients obtained by volume measurements because of techniques used in measuring. Matthews and Batcher [7] found, for example, that weights of cups of flour unsifted and dipped with the cup were about 29 percent greater than for flour sifted and spooned. Cups of flour unsifted and spooned were about 10 percent heavier than were those sifted and spooned.

In addition, Matthews and Batcher found that fairly consistent weights were obtained by individuals for one cup of flour in 5 replications. Among individuals, however, the difference between the highest and lowest mean weights per cup was just under 5 percent.

In view of the fact that the size of the one-cup measure can vary by ±5 percent, the variations within a given type of ingredient such as flour may account for some differences in weights of given volumes, that method of measuring affects amount, and that considerable variability due to individual practices can occur in the measurement of an ingredient such as flour, one wonders that successful baking ever occurs. Women in the United States seem to be satisfied with the present convenient system of measurement of ingredients in food preparation.

THE FUTURE

Trends in the food industry and in styles of living raise questions about the need for measuring devices in homes in the future. A growing array of food mixes requiring a minimum of preparation, heat-and-serve foods, and ready-to-eat items are available to families. The trend toward more meals away from home is continuing. In addition, food ingredients such as butter and margarine are packaged in forms easily measured without measuring cups. It would seem that the need for measuring devices might decline.

Three manufacturers of measuring cups and spoons whom we consulted about the future of measuring equipment reported that the demand for these items is continuing at a high level. Although less measuring per food item prepared may be required, some ingredients must still be measured. In response to an inquiry sent to 15 people associated with selected food and equipment manufacturers and food editors with women's magazines, eleven expressed the opinion that reliable, standard measuring devices are and will continue to be needed whether or not women use them correctly.

Among the respondents in the above-mentioned survey, eight recommended retaining volumetric measurements in recipes if the U.S. should change to the metric system of measurement. A combination of statements of volume for liquid ingredients and weight for dry or solid materials in recipes was suggested in three responses. A few people suggested that quantities in recipes should be stated in metric units for both weight and volume to give homemakers a choice in the matter.

CONVERSION TO THE METRIC SYSTEM

Various recommendations have been made for easing conversion of commonly used sizes of measuring devices in U.S. customary units to metric units for food preparation. Difficulties arise in obtaining conveniently rounded values without changing relationships between basic proportions of the devices such as those existing between the cup, tablespoon, and teaspoon. One suggestion for conversion is shown in table 2.

If the relationship between a measure corresponding to the customary cup and the customary tablespoon and teaspoon could be preserved in a conversion to the metric system, old family favorite recipes could be used with the new metric measures with no adverse effects to the product. The yield of the recipe would simply be increased slightly if cup size is increased to 250 milliliters, tablespoon to 15.6 milliliters and teaspoon to 5.2 milliliters. In a recipe for a 9-inch pumpkin pie, for example, the increase in yield of filling was calculated at less than one-fourth cup. On the other hand, a homemaker could use her U.S. customary measuring devices with recipes in the metric and turn out a yield slightly smaller than when metric measures are used.

Retaining the 16:1 ratio between cup and tablespoon would not be adhering strictly to a decimal concept. There is precedent for it, however, in the measures used in countries now on the metric system, as shown below:

U.S.
1 cup = 236.6 milliliters
= 16 tablespoons
1 tablespoon = 3 teaspoons

Germany
1 Suppenteller = 250 milliliters
= 16 Essloffeln
1 Essloffel = 3 Teeloffeln

Spain
1 taza = 200 milliliters
= 16 cucharadas
1 cucharada = 3 cucharaditas

Table 2. U.S. Customary Units, Metric Equivalents and Possible New Measures for Metrication in Home Preparation of Food: Volume

Current units of measurement			Possible new standard measures	
U.S. customary	Metric equivalents	Tolerance (±5%) permitted by 1963 standard[1]	I	II
	ml	*ml*	*ml*	*ml*
1 quart	946	[2]47.3	1000	1000
1 pint	473.2	[2]23.7	500	500
1 cup	236.6	11.8	250	[3]250
¾ cup	177.45	8.9	187.5	....
⅔ cup	157.7	7.9	166.7	....
½ cup	118.3	5.9	125	....
⅓ cup	78.9	3.9	83.3	....
¼ cup	59.15	3.0	62.5	....
1 tablespoon	14.79	.74	15.6	....[4]...
1 teaspoon	4.93	.25	5.2	....
½ teaspoon	2.46	.12	2.6	....
¼ teaspoon	1.23	.06	1.3	....

[1] American Standard: Dimensions, Tolerances, and Terminology for Home Cooking and Baking Utensils. Z61.1—1963. American Standards Association, Incorporated (now American National Standards Institute).

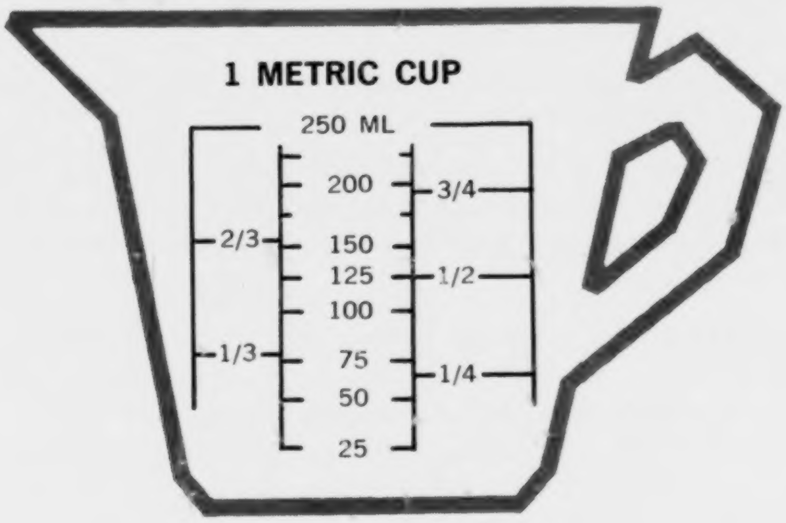
[2] Not in American Standard Z61.1—1963.

[3] Marked with 25-milliliter graduations; nested devices based on selected rounded metric subunits of this measure.

[4] Basic 10-milliliter spoon.

Eight of 11 respondents to the questionnaire sent to food and equipment manufacturers and to food editors were in favor of changing the capacity of the standard measuring cup from 236.6 to 250 milliliters if the U.S. converts to the metric system. Graduations of 10 or 25 milliliters were suggested most often. Additional markings suggested for the new cup in several responses were halves, thirds and quarters; others suggested that these marking should be avoided.

In order to differentiate 250-ml from customary 237-ml cups, the term metric cup [8] or "metricup" has been suggested. In actual use of these items, markings such as capacity and graduations should serve to differentiate them (fig. 1). The shape of the measuring device could be changed to facilitate differentiation if this seems advisable. In recipes, the quantity could be specified in actual metric units (as 250 ml) rather than as fractions of a cup or spoon.



Suggested graduations for a 250-milliter measuring device

FIGURE 3

Suggested capacities for measuring spoons calibrated in metric units varied among representatives of food and equipment manufacturers and food and equipment editors of women's magazines. Suggestions included the following:

(a) retaining present tablespoons and teaspoons without change,
(b) changing tablespoons to 15 milliliters and teaspoons to 5 milliliters, and
(c) developing a 10-milliliter basic spoon.

The terms for volume in the metric system which would most commonly be used in food preparation are liter and milliliter.

ADVANTAGES AND DISADVANTAGES OF ALTERNATIVES

Problems encountered in use of the current system of measurement are chiefly of two types. First, some people have difficulty in performing the necessary mathematics with fractions and mixed numbers when they need to reduce or increase the yield of a recipe. The same type of difficulty is encountered by people with limited mathematical aptitude who may need to reduce amounts of ingredients to basic proportions for recipe analysis. A change in the metric system which is based on multiples of 10 should facilitate such computations.

Secondly, some people may encounter a limitation on use of food information and recipes from other countries imposed by lack of knowledge of the metric system of measurement and lack of measuring equipment calibrated in metric units.

Conversely, then, advantages of change to the metric system of measurement for food preparation in homes could include—

(1) simplification of calculations and comparison of dietary information and recipes if quantities can be stated in multiples of 10, and
(2) easier international exchange and use of food preparation information.

Complete international acceptance of the metric system of measurement in food preparation could eventually lead to establishment of international standards for measuring devices and cooking and baking utensils.

A major disadvantage of change to the metric system of measurement for households would be obsolescence of presently owned and used utensils, measuring devices and recipes from the standpoint of markings and language. Changes that would minimize needs for discarding presently owned and used items until a homemaker wants to replace them either because she wants to own up-to-date items or to replace worn-out equipment would be desirable. Information to permit easy adaptation of presently owned materials to the new system of measure would be needed.

WEIGHT VERSUS VOLUME

In view of the fact that quantities of ingredients listed in recipes from countries now using the metric system of measurement are specified in weight for most dry or solid ingredients, a question arises about the desirability of following this method in the United States in the event of conversion to the metric system. An argument for this is that with volume measurement, variability in weight of a given volume of a specific ingredient is common. This variability can occur because of variations in measuring techniques and variations among brands of a specified type of ingredient. Fortunately, proportions of ingredients in many foods, even cakes, can be varied considerably without serious detriment (complete failure) to the product although characteristics may be slightly altered. For accurate, carefully controlled work such as is necessary in experimental work with food, ingredients must be weighed.

At present, few homemakers weigh ingredients in food preparation and there was little interest in going to this among women with whom we have consulted informally. For those who wish to weigh, however, scales or balances in metric units are available and simple tables or a graph such as is shown in figure 2 for conversion from avoirdupois to metric units (grams) could be used if needed. Dual statements of quantity of ingredients giving both volume and weight in metric units may be desirable in new recipes. Weights per unit of volume for selected ingredients are presented in the AHEA Handbook of Food Preparation [9] and in table 3.

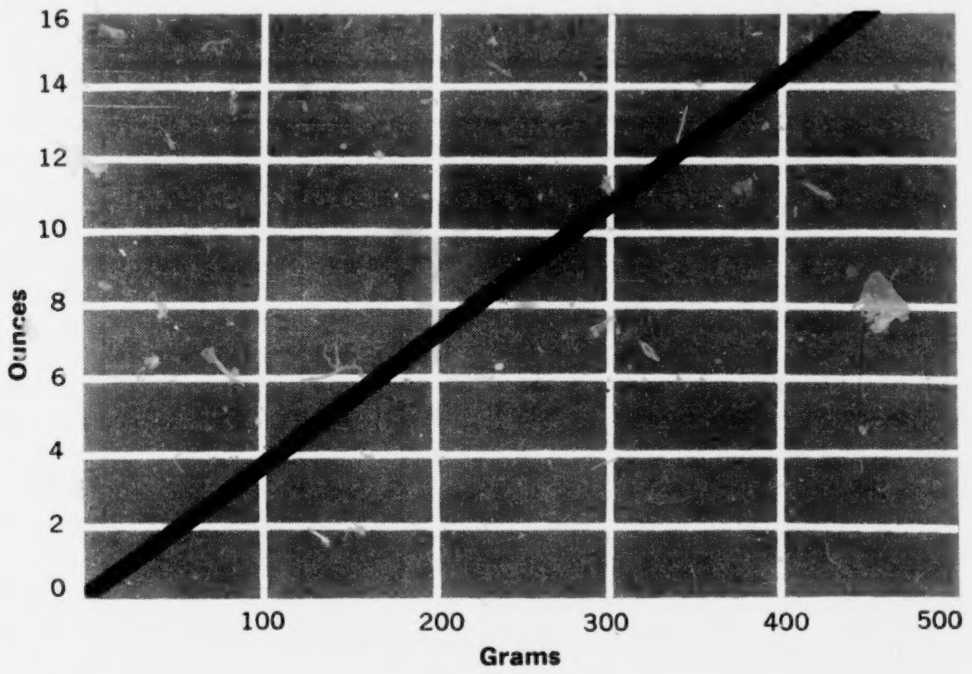


FIGURE 4
Weight conversion chart

The two terms for weight in the metric system with which women would need to become familiar are kilogram and gram.

Some thought has been given to whether weighing of ingredients is really necessary for the kind of cooking women in the U.S. do and to whether weighing or measuring of ingredients is the more difficult or troublesome. Disadvantages associated with weighing of ingredients include the initial cost of a set of accurate scales, the storage space requirement for the scales, and the need to train women to use them to achieve accurate weighing. Unless the scales are stored in a readily accessible place, the effort to get them out would discourage their use by most women. A few immigrants whom we have consulted from countries on the metric system have indicated that they considered weighing of ingredients an inconvenience in cooking and would prefer to use volume measurements in food preparation.

Assuming that a person knows how to use scales and has them conviently located in the food preparation center, he or she could probably weigh as easily as measure flour, sugar, and other solid or dry ingredients. The quantity of solid shortening, however, would be easier and more accurately determined by weight than by volume. On the other hand, butter and margarine are available in market units which can be readily subdivided into needed amounts without use of either scales or measuring cups.

Liquid ingredients and substances used in small quantities, such as baking powder, salt, baking soda, spices and the like, are more easily and probably more accurately measured by volume than weighed on home-type scales. If

Table 3. Weight (grams) of Selected Ingredients: U.S. Customary Cup and Proposed Metric Cup

Food item	U.S. customary Cup[1] (237 ml)	Metric Cup (or metricup)[2]					
		1 (250 ml)	(¾) (187.5 ml)	(⅔) (166.7 ml)	(½) (125 ml)	(⅓) (83.3 ml)	(¼) (62.5 ml)
	grams	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*
Fat:							
Butter or margarine	224	236	177	158	118	79	59
Oil	210	222	168	148	111	74	56
Lard	220	232	174	154	116	77	58
Hydrogenated products	188	198	150	132	99	66	50
Flour: All purpose sifted	115	121	90	80	60	40	30
Sugar:							
Brown, light or dark, packed	200	211	159	140	106	70	53
Cane or beet, granulated	200	211	159	140	106	70	53
Liquids: Milk	244	257	192	172	128	86	64
Leavening agents:							
Baking powder:							
Phosphate	197	208	156	138	104	69	52
SAS-phosphate	173	182	138	122	91	61	46
Tartrate	182	192	144	128	96	64	48
Baking soda	181	191	144	128	96	64	48
Miscellaneous:							
Salt, free-flowing	228	240	180	160	120	80	60
Cocoa	112	118	90	78	59	39	30

[1] Handbook of Food Preparation. 1964 revised ed. Washington, D.C.: American Home Economics Association.

[2] Calculated values.

some ingredients are to be weighed and some measured by volume, women would undoubtedly prefer volume measurements entirely for everyday food preparation.

COOKING UTENSILS

If a change is made from the current system of measurement to the metric system, and if capacities of measuring equipment are rounded to convenient quantities, corresponding adjustments in utensil sizes should be considered in order to accommodate changed yield from recipes. Consideration should be given also to the effect of change in volume and shape of pans on cooking time and quality of the finished food.

Dimensions for baking utensils commonly used in the United States are expressed in inches, but they could be expressed in centimeters. Scales for conversions in length between the two systems are commonly available.

Some rounding of dimensions may be necessary and should take into consideration recommendations for rounding of volume or weight in measurement of ingredients in recipes. Possibilities for common pan sizes rounded in metric units are shown in table 4. The unit of length in the metric system which women would need to learn in relation to food preparation is the centimeter.

Table 4. Utensils: Standard Sizes in U.S. Customary Units, in Equivalent Metric Units, and in Rounded Metric Units

Utensil	U.S. customary units	Equivalent in metric units	Metric units, rounded
	inches	*centimeters*	*centimeters*
Cake Pans			
Oblong	10 x 6 x 1½	25.4 x 15.2 x 3.8	25 x 15 x 4
	11 x 7 x 1½	27.9 x 17.8 x 3.8	28 x 18 x 4
	12 x 7½ 2 2	30.5 x 8.3 x 5.1	30 x 8 x 5
	13 x 9 x 2	33.0 x 22.9 x 5.1	33 x 23 x 5
Round	8 x 1½	20.3 x 3.8	20 x 4
	9 x 1½	22.9 x 3.8	23 x 4
	10 x 1½	25.4 x 3.8	25 x 4
Square	8 x 8 x 2	20.3 x 20.3 x 5.1	21 x 21 x 5
	9 x 9 x 2	22.9 x 22.9 x 5.1	23 x 23 x 5
	10 x 10 x 2	25.4 x 25.4 x 5.1	25 x 25 x 4
Tube	9 x 3½	22.9 x 8.9	23 x 9
	10 x 4	25.4 x 10.2	25 x 10
Pie Pans or Plates	4¼ x 4¼	10.8 x 3.2	11 x 3
	5 x 1	12.7 x 2.5	13 x 3
	6 x 1	15.2 x 2.5	15 x 3
	7½ x 1¼	19.0 x 3.2	19 x 3
	9½ x 1¼	24.1 x 3.2	24 x 3
	10 x 1½	25.4 x 3.8	25 x 4
	10½ x 1½	26.7 x 3.8	27 x 4
	11 x 1½	27.9 x 3.8	28 x 4
	12 x 1½	30.5 x 3.8	30 x 4
Cookie sheets	10 x 8	25.4 x 20.3	25 x 21
	14 x 10	39.6 x 25.4	36 x 25
	15½ x 12	39.4 x 30.5	39 x 30
	16 x 11	40.6 x 27.9	41 x 28
	17 x 14	43.2 x 35.6	43 x 36
	18 x 12	45.7 x 30.5	46 x 30
Jelly Roll Pan	15½ x 10½ x 1	39.4 x 26.7 x 2.5	39 x 27 x 3
Loaf Pans	7½ x 3¾ x 2¼	19.0 x 9.5 x 5.7	19 x 10 x 6
	8½ x 4½ x 2½	21.6 x 11.4 x 6.3	22 x 11 x 6
	9½ x 5 x 3	24.1 x 12.7 x 7.6	24 x 13 x 8
	11 x 7 x 3	27.9 x 17.8 x 7.6	28 x 18 x 8
	16 x 4 x 4	40.6 x 10.2 x 10.2	41 x 10 x 10
Muffin or Cupcake	1¾ x 1	4.4 x 2.5	5 x 2
	2½ x 1¼	6.3 x 3.2	6 x 3
	3 x 1½	7.6 x 3.8	8 x 4

Source (columns 1 and 2): American Standard: Dimensions, Tolerances, and Terminology for Home Cooking and Baking Utensils. Z61.1—1963. American Standards Association, Incorporated (now American National Standards Institute).

Dimensions of standard utensils used for baking in U.S. homes are stated in inches to the nearest one-fourth inch. Tolerances of ± one-fourth inch are recommended by American Standard Z61.1-1963 [1]. Measurements of width, length, and diameter are made at the top, inside. Depth is measured inside and perpendicular to the bottom. Dimensions for some common utensils are shown in table 4.

Standardized pan sizes permit smaller household inventories of utensils than would otherwise be possible and facilitate specification of pan sizes and cooking times in recipes and cooking instructions. Chances of obtaining uniform baking results from one time to the next are thus improved if pans of specified size are used each time.

Capacities of saucepans and casseroles are stated in liquid measures, level full, and usually in quarts or fractions of quarts. If they are standard utensils, actual capacity is within ± 5 percent of total stated volume. With the metric system, capacities would be stated in liters or milliliters.

Sizes of skillets or frying pans are specified by inside top diameter in inches. In the metric system, this measurement would be given in centimeters.

COOKING TEMPERATURES

Cooking temperatures in current use in food preparation in homes in the United States are stated in degrees Fahrenheit. Temperatures are specified for baking and roasting; for determining end-points of cooking for icings, candy, and meat; and for temperatures for fat in deep-fat frying. Estimates of cooking time in minutes or hours are usually included with recipe information as guides for cooking given quantities of food in a given temperature range.

Oven temperature controls are commonly calibrated in 25° intervals on the Fahrenheit scale. Meat thermometers are usually in 10° intervals; candy, 2°; and deep-fat thermometers, in 2° or 5° intervals.

In the Schlessinger and Kennedy study [8] of conversion to the metric system of measurement for food preparation, no difficulty was foreseen in conversion from the Fahrenheit to the Celsius (Centigrade) scale for temperature measurements in cooking. Until ranges and appliances with temperature controls calibrated in the Fahrenheit scale are replaced by those with Celsius scales, however, and as long as women wish to retain and use old favorite cookbooks and recipes, conversion tables for temperature should be available to them.

Assistance on conversions may be provided in simple tables showing Fahrenheit and Celsius temperature equivalents. Charts could also be available from which temperatures could be converted directly from Fahrenheit to Celsius (fig. 3). In addition, clever conversion devices are available on which either Fahrenheit or Celsius scales can be read, depending upon the angle at which the surface of the device is viewed.

For listings of suggested cooking temperatures with recipes, possible roundings on the Celsius scale are suggested in table 5 with current descrip-

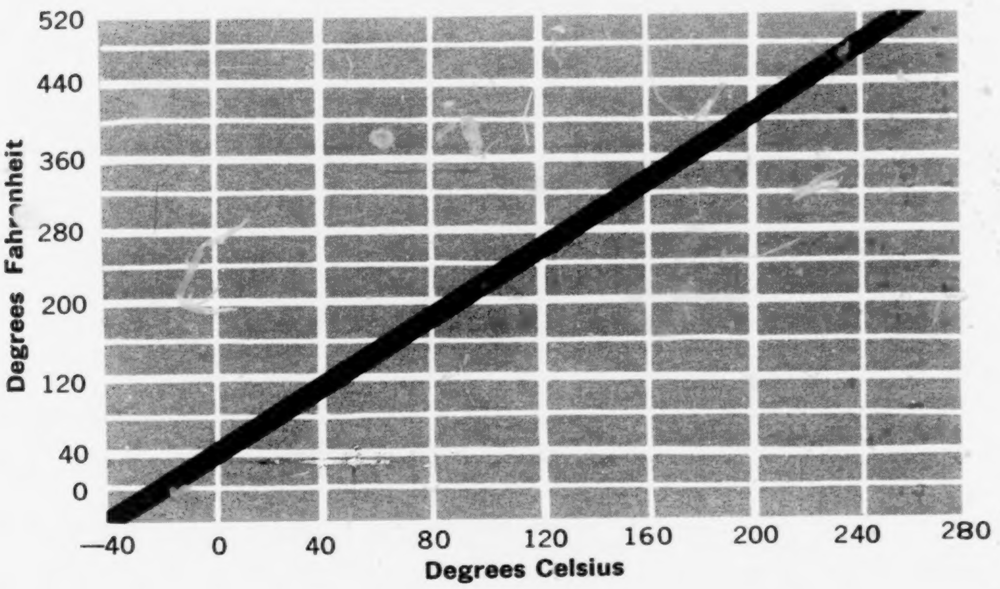


FIGURE 5
Temperature conversion chart

tive terminology. Temperatures in Celsius could be readily rounded for oven temperatures, roasting, and deep-fat frying without detriment to products. It may be necessary to compromise on oven temperature values to some extent to be consistent with the temperature intervals manufacturers can provide in Celsius on range controls. For candy-making, use of exact conversion values in Celsius would be desirable because end-point temperatures are critical.

EDUCATING FOR CONVERSION

In order to help consumers adapt to a new system of measurement, short programs on television (shown at suitable hours) on differences and similarities between the metric and U.S. customary measures and on practical applications of the new measures in food preparation would be desirable. Editors of newspapers and women's magazines would undoubtedly feature information on the new measuring system—what it will mean and how to adapt to it in using old and new recipes, measuring devices, and utensils. Conversion tables and charts on temperature, volume, weight, and length will be desirable. Excellent conversion information is provided in the AHEA *Handbook of Food Preparation.*

Conversion to the metric system should be planned to allow women to continue to use present equipment (ranges, electric portable cooking ap-

Table 5. Cooking Temperatures for Foods: Fahrenheit and Centigrade Scales

Cooking operation	Temperature		Possible rounding of temperatures
	°F	°C	°C
Baking: Oven temperatures:			
Very slow	250 and 275	121 and 135	120 and 135
Slow	300 and 325	149 and 163	150 and 165
Moderate	350 and 375	177 and 190	175 and 190
Hot	400 and 425	205 and 218	205 and 220
Very hot	450 and 475	232 and 246	230 and 245
Roasting: Internal temperatures: Beef:			
Rare	140	60	60
Medium	160	71	70
Well-done	170	77	80
Deep-fat frying:			
Chicken	350	177	175
Doughnuts, fish	350 to 375	177 to 190	175 to 190
Cauliflower, onions	375 to 385	190 to 196	190 to 195
Potatoes	385 to 395	196 to 201	195 to 200
Candy-making			
Thread	230 to 234	110 to 112	No rounding
Soft ball	234 to 240	112 to 115	
Firm ball	244 to 248	118 to 120	
Hard ball	250 to 266	121 to 130	
Soft crack	270 to 290	132 to 143	
Hard crack	300 to 310	149 to 154	

Source: Handbook of Food Preparation. Washington, D.C.: American Home Economics Association. Revised 1964. (Additional information is calculated from figures in the Handbook.)

pliances, utensils, and the like) and recipes until they need or feel compelled to replace with new. Conversion information from U.S. customary to metric units in a readily understandable form should be available to them. New equipment for replacements would be expected to be calibrated in metric units and new recipes would be written with metric terminology and units of measure.

REFERENCES

[1] American Standard Z61.1-1963: Dimensions, Tolerances, and Terminology for Home Cooking and Baking Utensils. (Sponsored by American Home Economics Association). (American Standards Association Inc., Now American National Standards Institute, N.Y., 1963).

[2] Fisher, Marian Cole. *Twenty Lessons in Domestic Science*, (Marian Cole Fisher, St. Paul, 1922).

[3] Housekeepers vote for standard measures. *Good Housekeeping*, pp. 80, 183 (April 1925).

[4] Sweeney, Elizabeth. Some cooking and baking utensils studied. *J. Home Economics* **40**, 309-310 (June 1948).

[5] Halliday, E. G., and Noble, I. T., *Hows and Whys of Cooking*, pp. 31-32 (The University of Chicago Press, Chicago, 1928).

[6] Peet, L. J., and Sater, L. E., *Household Equipment*, p. 147 (John Wiley and Sons Inc., N.Y., 1934).

[7] Matthews, Ruth H., and Batcher, Olive M., Sifted versus unsifted flour. *J. Home Economics* **55**, 123-124 (February 1963).

[8] Schlessinger, Phyllis E., and Kennedy, Barbara M., Metric measurements in food preparation. *J. Home Economics* **59**, 121-123 (February 1967).

[9] *Handbook of Food Preparation*, (American Home Economics Association, Washington, D.C., Revised 1964).

PURCHASE AND USE OF KITCHEN EQUIPMENT

Helen M. Goetz

Department Home Management, Consumer Economics and Equipment,
School of Home Economics, University of Alabama

PRESENT MEASUREMENT SYSTEM USAGE

This paper considers the implication of increased use of the metric system in the manufacture of kitchen equipment and how this would affect the consumer. It relates to the following items:

Small portable appliances (electric and nonelectric)
Refrigerators and freezers
Ranges (gas, electric and microwave)
Dishwashers and food waste disposals

Imports do not play an important role in the purchase of large appliances at the present time. The 550-page buyers guide of the trade journal, *Made in Europe*, lists only one manufacturer of refrigerators. This company from Portugal advertised a refrigerator giving the capacity in liters; however, below the picture of the refrigerator were shown TV sets, and the size of the screen was given in inches. Small electrical appliances from Belgium, Italy, Germany, etc. may be purchased either in 110V or 220V. Dimensions and capacities were listed in both the metric and the imperial system. Cookware (enameled, stainless steel, or aluminum) from France, Germany, Denmark, and other countries gave dimensions and capacity in both measurement systems, with the metric system in round numbers and the American system in fractions. None of the advertisements made reference to the gauge of the material. Cutlery and small cooking utensils were quoted in both systems. Literature from Japan generally uses the customary system, although Japan itself has adopted the metric system.

At the present time, the following measurements are used by the American industry manufacturing houseware or kitchen appliances:

(Since electricity is already measured in metric units, electrical measurements will be omitted here).

Interviews with neighbors, colleagues, and utility home economists bore out the contention that Mrs. American Homemaker in her kitchen is not handicapped by the use of the customary measurement system, nor would she benefit from knowing that the capacity of her refrigerator were 380 liters instead of 13.4 cubic feet. She could operate under one of the two systems or even use both simultaneously. In reality, she has been doing this for some time. She demonstrates the use of metric measurements when she explains that her toaster uses 1,200 watts.

Regardless of which system of measurement will finally be adopted, standardization and improvements could make measurements of, for instance, the capacity of a freezer less complicated and less confusing. It is a known fact that the volume of 150 pounds of whipped topping varies considerably from that of 150 pounds of beef roast.

Small Appliances:	*Description of size, dimensions, etc.*
Coffeepots	Cups—not very accurate as size of cups varies.
Motor Driven	Horsepower and RPM measurements are not very meaningful to the homemaker. The size of mixing bowls is not important, except for "large" or "small."
Cookers, fryers, toasters, waffle irons, etc.	Not all thermostats give temperature; some indicate food to be cooked. Usefulness depends on available recipes.
Major Appliances:	
Food Disposers	Dimensions in inches, size of motor in horsepower, capacity in quarts.
Trash Compactor	Dimensions in inches; pressure of compressing 2000 lbs/sq. in. capacity—60 gallons garbage, size in inches.
Dishwasher	Dimensions in inches. Heating element in degrees Fahrenheit. Capacity—number of place settings (not very meaningful). Water used in gallons.
Ranges:	
Gas	Fuel in cubic feet. Heating value of gas in British Thermal Units/cubic foot. Dimensions in inches; oven size in inches; temperature in Fahrenheit.
Electric	Dimensions in inches; oven size in inches; temperature in Fahrenheit, thermal efficiency, a measure not used by the homemaker.
Micro-wave	Power in metric system; outside dimension in inches
Refrigerators and Freezers	Temperature in Fahrenheit; capacity in cubic feet (food storage); shelf area in square inches; dimensions in inches; horsepower of motor not used by homemaker; capacity of freezer either in pounds or in cubic feet.
Cutlery	Length of blades in inches.
Cookware	Capacity in quarts or fractions thereof; gauge of metal in numbers which represent fractions of inches.

FUTURE IMPACTS OF METRICATION

Before considering the effect on the consumer of increased use of the metric system, it would be wise to ask this important question: "Do we plan to convert the designation of things to metric names or numbers, or do we intend to convert the things themselves?" For example, a standard 8½"×11" sheet of paper would have 3½ millimeters trimmed from the side and 2.1 centimeters added to the length to make a 21×30 centimeter sheet of paper in order to have round, decimal-free numbers.

The American consumer's situation could become rather difficult if some branches of our industry and business decided to replace the customary system or make a complete conversion to the metric system while others retain the old. In purchasing new pieces of equipment, the consumer would be required to learn the new nomenclature. Here, mass confusion is not foreseen since such pieces of equipment are not acquired very often, and once the purchase has been made, the homemaker does not concern herself with such measurements. However, when the question of replacement of existing equipment arises, especially if it pertains to built-in equipment, one may run into more problems. The building industry would have to coordinate its activities with the appliance industry. Increased standardization and prefabrication of kitchen cabinets would demand a unified system of dimensions. It is safe to assume, though, that any remodeling of existing space will require skilled labor to make adjustments, regardless of the system of measurements used, and will, therefore, be costly.

An undertaking of the dimensions of the proposed changeover to the metric system demands careful planning and direction as well as uniformity in timing and degree. A nationally planned program—Federally Coordinated—should reduce the amount of confusion, discrimination and costs imminent in a changeover.

Within the area of kitchen equipment, the units to be changed would be mass (ounces to grams), length (inches to centimeters) and temperature (degrees Fahrenheit to degrees Celsius). Although there may be initial cost of conversion to the manufacturer, a reduction in the cost of manufacturing and ultimately in consumer prices could result. Industry has, over the years, increased its use of the metric system and is, therefore, far ahead of the consumer. Some advantages to the metric system would be that it is more exact, eliminates fractions, and ultimately would be less costly since it would do away with duplication of tooling.

From the beginning efforts should be made to eliminate some of the meaningless descriptions such as pounds in describing the size of a freezer. Such improvements would be desirable even if our system of measurement does not change.

While the consumer might be upset about the prospects of such a change, it would not take too long to make the adjustment; at least, not in the area of the kitchen equipment discussed here. It will take the efforts of government together with industry, retail trade, and educational institutions to overcome any mental blocks people may have, such as "too difficult."

Education should begin early in school. Our mass communication system has made names and concepts and even bad grammar "household words" in very short time. It should not be too difficult to employ it in this educational pursuit. Charts and conversion tables, as well as government and other bulletins should be readily available.

In the opinion of the author, there should be less difficulty to switch to the metric system than to unlearn the old. In the purchase and use of kitchen equipment described in this paper there would be little immediate advantage to the individual consumer, and adoption of the new system could be gradual without hampering general advancement.

METRIC LABELING FOR FOODS, DRUGS, AND COSMETICS

Wallace F. Janssen

Food and Drug Administration

Jack and Jill went [illegible] the hill
To fetch a pail of water
Jack fell down and broke his crown
And Jill came tumbling after.

In the days of Charles I the jackpot, the gill and the pail were common units of measure, and measures were a base for taxation, even as some are today. A sales tax was introduced on the jackpot; at the same time its quantity was reduced, increasing the number of taxable units and perhaps to conceal the amount of the tax.

Chauncey Leake tells the story in his 1959 lecture on "Standards of Measurement and Nursery Rhymes." [1]

In an absolute monarchy, the poor had no opportunity to protest; their views were reflected in back-alley satire. This Mother Goose rhyme concealed a bitter public resentment. As Leake sums it up, "In this verse are three common volume measures, one of which, the jackpot, lost its value as guaranteed by the crown, and the result was a general depreciation of standards." This measure, originally used for the purchase of small amounts of milk, honey, wine, and perhaps cereals, survives today only as a gambling term.

In the 18th century, variation and confusion in weights and measures was a centuries-old problem, victimizing the poor and enriching the traders. One of the chief things desired by the people was uniformity in measures, so they would no longer be cheated in the market place. It was no accident that the metric system originated as a planned project of the French Revolution.

This paper looks at conversion to the metric system as it may affect consumers of products regulated under the Federal Food, Drug and Cosmetic Act and the Fair Packaging and Labeling Act. Particularly, it explores the health significance to consumers of metrication.

HEALTH

The search for background for such a discussion reveals much that is interesting, but less which has a direct bearing on the subject. Certainly no facts or reasons were found to conclude that changing to the metric system would have any adverse effects on the health or safety of the U.S. consumer. On the contrary, it is clear that the metric system has made a tremendously important contribution to public health. The value of that contribution is incalculable, because the metric system is an integral element in all scientific activities.

As to health products and services, the United States has long since converted, very largely, to the metric system. That change was evolutionary, rather than compulsory. It came because of the advantages of a more scientific and accurate system of measure for research, manufacturing, control and dosage.

LABELING REGULATIONS

The Federal Food and Drug Act of 1906 required packaged foods to be plainly and conspicuously marked in terms of weight, measure, or numerical count. Food labeling regulations required avoirdupois weight, liquid measure based on the U.S. gallon, or dry measure in terms of the U.S. standard bushel. But the food regulations also provided "that statement of quantity may be in terms of metric weight or measure [2]." There was no corresponding regulation as to drugs.

The Federal Food, Drug and Cosmetic Act of 1938, which replaced the Act of 1906, requires a quantity statement "in terms of weight, measure, or numerical count . . . which are generally used by consumers." Regulations spelled out the details in terms of English units, as in the 1906 Act, but permitted a supplementary statement in metric terms for foods and cosmetics. As to drugs, the 1938 regulations permitted either English (apothecaries') units or metric units [3]. The absence of a statement of quantity was defined as misbranding, subject to the legal penalties of the Act.

Manufacturers of proprietary nonprescription medicines generally elected to give the dosage in the apothecaries system. This was also the practice of firms which marketed prescription drugs directly to physicians, where the dosage was well established in apothecaries' measure.

A former pharmaceutical industry executive who went through the conversion recalls that its cost and inconvenience were not inordinate. "We recalculated our manufacturing formulas, the formula statements on labels, the dosages, and revised our package inserts. It necessitated a change of balances and scales, and the calibration of containers, revision of labels, inserts and copy on cartons. Beyond this there was a minimum of inconvenience. Compared to the problems of conversion in other industries, conversion in the pharmaceutical industry was a breeze."

The conversion was necessitated and hastened by the discovery and introduction of vitamins and hormones into medical therapy. The dosages of such drugs were so small that when expressed in apothecaries' terms they were odd portions of grains, difficult to use and remember. It was much simpler to express the dose in milligrams.

Another factor which hastened the change was a growing trend in teaching medical students to use the metric system. Later, when they went into practice and found apothecaries' dosage still in the catalogues and labeling of firms which had not converted, they saw it as an inconvenience, forcing them to make a conversion in reverse, so to speak.

Today prescription medicines and many other medical products are manufactured, controlled, labeled and administered with metric measurements.

But what of the 5 gr. aspirin tablets, or the cough medicine given by the teaspoon? For the U.S. consumer there has been no change, even though the manufacturer may control the dosage metrically. In Britain, however, change is beginning to have its impact. A special section of the London Times of July 14, 1970, devoted to Britain's conversion to metrics and decimal money, makes this evident:

> Less spectacular but more insidious was the battle at the pharmacy. Perhaps because a man's resistance is at its lowest in sickness the victory was easiest there. But we have scarcely yet seen what it means. It means for a start that a well-tried measure has gone. No longer do we use the dear, indeterminate teaspoon that allowed us to be lavish with the honey and sparing with the tincture of quinine. Now the chemist issues with our prescriptions a measure that is plastic, forbidding and exact. It is marked incomprehensibly "5 ml."

For the record, a teaspoon is 4.9 ml., and a 5 gr. aspirin would be a 324 mg. aspirin.

The survey of home economists, by the Consumer Interests Committee of the American Home Economics Association, disclosed that 23 percent of the respondents saw no consumer advantage in such a change while 34 percent felt that world uniformity in measurements would have indirect benefits. In contrast, 61 percent of the sample saw a direct advantage through easier price comparisons in the market place.

METRIC LABELING

One may ask whether these results, especially the 61 percent figure, reflect some wishful thinking. Certainly American consumers have had a very real need for better means to relate quantity and price, a need met only partially by the Fair Packaging and Labeling Act of 1966. A major purpose of that law was to enable the shopper to make an easier calculation of the price per ounce. To that end the quantity in a package is required to be conspicuously stated, in a uniform location, and in multiples enabling the shopper more readily to determine the unit price. A plan for voluntary standardization of sizes was included to deal with cases of "undue proliferation."

The Fair Packaging and Labeling Act broadened the coverage of Federal packaging law to all "consumer commodities." Sec. 4(a)(3) of the Act requires use of English units, with common or decimal fractions of the avoirdupois pound, ounce, or liquid measures for any remainder from such units. Prescription drugs, however (as defined by the Federal Food, Drug and Cosmetic Act), are specifically excluded from the definition of "consumer" found in Sec. 10(a).

FDA regulations for the enforcement of both laws are contained in Part 1, Title 21 of the Code of Federal Regulations; Sec. 1.102c(b) allows either English or metric declarations of quantity on prescription drugs. As to over-the-counter drugs, Sec. 1.102d required avoirdupois weight or liquid measures based on the U.S. gallon, but the strength of dosage may be stated in either grains or milligrams.

With the exceptions noted, the Fair Packaging and Labeling Act requires quantity to be declared in the English system of measure, while permitting by regulations the optional and additional use of a metric declaration. Section 1.8b of the FPLA regulations provides for this additional statement of quantity. Such a dual declaration is most frequently seen in our supermarket on packages of imported foods, and occasionally on U.S. foods and cosmetics which are packaged for export as well as domestic sale.

Examples of such packages were interesting for several reasons.

Exhibit 1. A package of pastry shells labeled 3¾ ounces and 106 grams. This truly international package had display labeling in five languages—English, French, Danish, German and Spanish. Obviously the English biscuit manufacturer intended it for sale in all the countries where those languages are spoken. It illustrates why Britain is going metric.

Exhibit 2. A package of Italian noodles with the round metric quantity of 500 grams in the upper right corner, and the English weight in the lower left corner in large type which more than complies with the U.S. Fair Packaging and Labeling Act. It reads "16 and $^{10}/_{16}$ ozs. or 1 lb. and $^{10}/_{16}$ ozs."

Exhibit 3. A can of Scottish Haggis, a kind of scrapple made from sheep liver, oatmeal and onions. The standard No. 303 can is marked 14½ ozs. and 410 grams.

Exhibit 4. A quarter pound tin of Twinning's Earl Grey tea, containing 113 grams, metrically.

To make mandatory this type of dual declaration would, of course, require amendment of both the Food, Drug and Cosmetic Act and the Fair Packaging and Labeling Act.

METRICATION IN GREAT BRITAIN

At this point, the best information for predicting consumer reactions to metrication comes from Britain. The report of the Metrication Board, "Going Metric—the First Five Years" is a complete and revealing reference. But it was in that special section of the London Times, previously quoted, that one finds the viewpoint, the "flavour," so to speak, of consumer reaction.

> Dropping the imperial system should make calculations quicker and more accurate, both for humans and machines. Working in tens should also reduce the numbers of different sizes of products required, simplifying manufacture and cutting stocks.
>
> Education will show the fastest return on the change. Present time for teaching basic mathematics is likely to be cut by at least a third. Instead of pupils dropping mathematics at the earliest possible moment at school, more will persevere and become the scientists and engineers that industry needs.
>
> Changing over is to be gradual. Each section of the economy can move at its own pace. The front runners are those already influenced by international trade, the pharmaceutical industry, papermakers, engineers and others.

> The Government can afford to be complacent about costs—the bills will not be delivered to Whitehall. Mr. Wedgewood Benn, then Minister of Technology, said in 1968: "There can be no questions of compensation. The costs of adopting metric weights must lie where they fall." This may be equitable for a large company, which hopes to gain from streamlining its operations by metrication and can set off some of the cost against tax. But how much thought, I wonder, has been given to the chap who runs a corner shop? He could find it difficult to finance new equipment. He is also the one at the end of the line who is going to have to explain to customers that they cannot have pounds, pints, or yards any more. Difficulties in retailing—it is not expected that shopping will be metric until two or three years ahead—will be eased by the trend to sell goods by number or packet instead of weight or volume. The giant economy size and the handy minipack have severed any connection they ever had with weights and measures.
>
> Nobody need fear that going metric will take all the eccentricity out of shopping. In France, where it all began, many wives find the kilogram, weighing roughly 2.2 lb., too big for their needs. Traders oblige by selling foods in half kilos. They call it selling by the pound.

Actually metrication in Britain has not gone far enough, as yet, to get a good reading on its consumer impact. The major change today is the related conversion to decimal money, which the United States has enjoyed for 180 years. It is as though the entire nation was shifting to a foreign currency, but one quickly understood. The Times article quoted said that there were 1,250,000 cash registers to be converted by February 15, 1970, when the changeover would become final, not to mention countless pay telephones and vending machines.

Notwithstanding the absence of compulsory legislation, the British industries are cooperating to work out the problems of a far-reaching economic and social change. Expecting a transition which will last many years, they intend nevertheless to go all the way. They have compelling reasons for conforming their measures with those of the great majority of the other nations.

Particularly significant, from the consumer standpoint, are the initial moves toward standardization of package sizes in metric terms.

Gasoline, beer and milk were singled out for more rapid change. The Metrication Board report states that all new price computing pumps installed since October 1, 1968, have convertible heads to dispense in liters when the changeover is made. Conversion of older pumps is scheduled for completion in 1975.

Concerning milk the Board states: "Our view is that a round metric quantity as the unit of sale for milk is of special significance. It will bring the reality of metrication into the home and classroom more than any other change."

The returnable pint bottle is the basic package for milk in Britain, and there is great reluctance to change, which will require legislative action. The industry wishes to retain the pint bottle—whether or not it be labeled 568 milliliters. Metric proponents suggest a 600 ml. bottle. Many intricate questions and problems are involved in this debate.

Beer poses a similar complex of problems, as well as the conversion of the dispensing meters used for draft beer.

At a series of meetings in 1969 British food manufacturers agreed in principle on a model series of metric quantities which were to be considered in detail by different industries. As examples, 125 grams would be the replacement for ¼ lb., 250 grams for ½ lb., 500 grams for 1 lb., and one kilogram for 2 lbs. A working group representing Germany, France and the United Kingdom is reported to be considering the possibility of common European standards.

METRICATION, PACKAGE SIZES, AND LABELING

It is the arithmetic of package sizes which is the most significant aspect of metrication from the consumer-purchaser's point of view.

To merely place metric numbers on standard English units of measure will not simplify the consumer's arithmetic or price comparisons.

To do this on the multitude of products which are packaged in odd sizes will further complicate what consumers fought to correct through the Fair Packaging and Labeling Act.

A dual system would be necessary in a transitional period. But only through complete conversion and standardization of sizes can decimalized numbering, measuring and money be fully coordinated to provide the consumer with substantial direct benefits.

It is apparent that consumers very frequently need quantities that are much less than a kilogram and much more than a gram. An intermediate unit or units, in decimal terms, would have practical advantages. We have long been decimalizing the pound in weighing and marking such products as cheese and meats. The next step might be a "metric pound: of 500 grams, divided into 10 "metric ounces" of 50 grams. This would make possible such quantity declarations as:

10 oz. = 1 lb. = 500 grams
7 oz. = 0.7 lb. = 350 grams
9.5 oz. = 0.95 lb. = 475 grams
11 oz. = 1.1 lb. = 550 grams

Then if a product were priced at 95 cents per pound, the price per ounce could be instantly known to be 9.5 cents. Arithmetic, or a slide rule, would still be needed to get the unit price for non-standard, odd-size quantities.

As the Metrication Board puts it, "Metrication is an investment in efficiency." The United States has already gone metric in countless ways—a trend that is bound to continue. By decimalizing, for example, measuring agricultural products by the hundred weight instead of bushels, we are getting around some of the problems of nonscientific measures. Inevitably we must—and will—go farther.

REFERENCES

[1] Systems of Units, Pub. No. 57, (American Association for the Advancement of Science, Washington, D.C., 1959).

[2] Probably in deference to 1866 "Act to Authorize the Use of the Metric System of Weights and Measures." U.S. Rev. Stat. 3570.

[3] General Regulations for the Enforcement of the Federal Food, Drug and Cosmetic Act, Dec. 28, 1938. 3 F.R. 3167.

PURCHASING WOMEN'S READY-TO-WEAR CLOTHING

Margaret Warning

Textiles and Clothing, College of Home Economics, Iowa State University

INTRODUCTION

In the area of women's ready-to-wear apparel, definite advantages could result if the United States of America were to change from using the customary system to the modernized metric system of weights and measures. There would be a few disadvantages and problems which might disturb consumers, too.

In this paper, the advantages of consumers are presented first, then the disadvantages and problems are considered. Following those presentations is a list of actions which seem necessary if the U.S. is to convert to the metric system, and in conclusion, my opinions and recommendations. Although I have consulted manufacturers and retailers, I was invited to write as a *consumer* of women's apparel and the opinions expressed here are given primarily and intentionally from a consumer's point of view.

ADVANTAGES WHICH MIGHT COME TO THE CONSUMER WITH A CHANGE TO THE METRIC SYSTEM

Several advantages would probably benefit the consumers of women's ready-to-wear apparel if the U.S. changed to the metric system. The most obvious of these would be that a complete change to another system would give an opportunity to plan carefully and to establish an efficient structure for sizing and labeling and categorizing women's ready-to-wear apparel which we will not undertake if we continue to use our established customary system. This is not due to the metric system, but is an advantage which would result from making an extensive change.

Any consumer of women's ready-to-wear apparel will agree that the system of sizing garments for women is faulty. In the first place, the system is inconsistent: A garment such as a dress may be marked as a size 14 in a moderately priced department of a store; a customer may try on the size 14 dress, be satisfied with the fit of the garment, but if she goes up three or four flights to a higher priced department of the same store she may find that a size 14 dress is too large for her and that she should buy a size 12 dress. Perhaps she goes to a department where raincoats are sold; there she may find a size 10 is large enough to fit her. If she shops for foundation garments or undergarments such as slips, she does not ask for any of these sizes 14, 12, or 10, but asks to try on garments which she designates by her waist or her bust measurements. If she wants to purchase a brassiere, she not only asks for a garment which corresponds to her bust measurement, but she must ask for the correct size cup and these are designated by letters which indicate sizes A, B, C, and D. For some garments, the consumer asks for the size she wants by using a title such as Half Size. In shopping for shoes, she asks for last or length in number measurements, while the widths of shoes are indicated by letters which are doubled or tripled to indicate a narrower shoe, for example her shoe might be an 8½AA. Hats are sometimes sized by actual dimensions of the head circumference, for example 22 inches. Gloves are sized by the measurement of the hand around the back and palm, but the length of the glove is given as so many buttons. With all of these ways of sizing and indicating the sizes of the garments, it is no wonder that customers are confused and frustrated when they shop for women's ready-to-wear garments. Our present system has become established by practice through the years without a consistent plan. It would be theoretically possible to change the methods of sizing and labeling without changing to the metric system, but I doubt that this would ever be undertaken unless the U.S. changes to a completely new measurement system. A change would give the industry and the consumer the opportunity and the motivation to plan an efficient, uniform, and consistent way of sizing and designating sizes of garments for women.

Another advantage to consumers is that changing to a new system might make it possible to establish the habit of indicating sizes of women's garments by giving actual dimensions of some of the important measurements such as bust measurement of a dress, waistline measurement, skirt at the hips, length from neckline to waist at center back, skirt length from waist to hem and long sleeve length. Labeling with a few actual dimensions would be a tremendous advantage to the consumers of women's garments over our present ways of sizing. Only a few dimensions would be needed and they would not be difficult to obtain because they would have been known at the garment cutting stage. Ideally, all women's garments in the future would be labeled with dimensions of the garments so that the consumer could know what she was selecting rather than having to interpret sizes from some meaningless title, from numbers which once suggested chronological age, or from letters of the alphabet.

It would be difficult to introduce the practice of sizing garments by actual dimensions in our present market, because we are used to the established, faulty system. If we were to change to an entirely different system of measurements, however, it might encourage us and motivate us to make a greater change than we would be willing to undertake otherwise.

An important advantage to consumers which would come about with planned metrication is that our ways would be more like the rest of the world. People who live in the United States seem to want to be respected and liked by the people in other countries of the world. We have tried to establish and to maintain a favorable impression and we have been bitterly disappointed when we find that people in other countries misunderstood our motive, our behavior or our intentions. At present we are practically alone in using our customary system. If we changed to the system which is used by 90 percent of the world, we would seem to be less different and more like other people, not only in their eyes, but to ourselves as well. We need to do everything we can to encourage the sense of unity among people around the globe. Members of our society do not want to be nor to remain ethnocentric, but this characteristic is one which we appear to have and it is a characteristic which is difficult to overcome. We need to do everything possible to correct it and to indicate to others that we are not really ethnocentric. Changing to the system used by most of the people in the world would be one big and important first step in that direction.

To convert to the metric system to reduce ethnocentricity among members of our society would be for philosophical and psychological reasons, but there would be a very practical advantage, too. A common system of measurements would simplify world trade and the importing and exporting of women's garments. The U.S. has for years imported high fashion garments from Paris. Throughout our history, some of our consumers of women's apparel have purchased garments from Europe. Today women's ready-to-wear apparel which is produced outside the United States is imported from a wider variety of countries than was true a generation ago, but most of these countries are using the metric system. There is also an increase in the amount of partially constructed garments which are imported into the U.S. from countries where metric measurements are used. For example, partially constructed or cut pieces of garments were sent to foreign countries and reshipped to U.S. as finished garments as follows: brassieres from Mexico, Caribbean, and Phillipines; dresses from Mexico, Jamaica, Costa Rica; pants, slacks, and shorts for women from Mexico; blouses from Mexico and Trinidad; coats and jackets from Mexico and Canada. Most of these countries already use or are now converting to the metric system.

We are "good" customers in world trade, so for our convenience, garments which are made in other countries are usually measured, labeled, and described in our customary units, increasing the costs, efforts and confusion. Even magazines and catalogs of women's garments published in other countries, but for use in the United States, have been made to suit our vocabularies, our expressions, and our convenience. Having two different inventories and two different publications to suit customers who are using different systems of measurement must be difficult, time-consuming, and costly and sometimes confusing. The difficulties could be reduced if we had the same system of measurements throughout the world. World trade is a small part of the women's ready-to-wear industry, but it is an interesting small part. World trade in women's ready-to-wear would be simplified if we had one international standard used by everyone.

Citizens of the U.S. are traveling to other countries in increasing numbers. There are many complaints about difficulty in communication when shopping for garments which are to be gifts for people at home. If all countries used the same system, there would be fewer mistakes in selection. A fifth advantage if we were to change to the metric system would be that shopping in foreign markets would become more familiar and less difficult.

Another advantage of a change to the metric system would benefit a group of people directly, and consumers of women's ready-to-wear indirectly: Many people who are employed in the United States in the apparel industry learned to do their work in other countries where the metric system is used. They have learned to design, to create, to drape, to cut, to construct garments using the metric system. They are delayed and disturbed when they have to work with unfamiliar tools and measuring devices and measurements. If we used the same system, the transfer of these highly skilled and experienced and valuable workers would be less difficult.

Another group of people, although a much smaller number and less likely to remain as a permanent part of our society, are the international students whose learning is sometimes delayed because of having to try to learn our customary system. For example, an instructor from a South American University indicated that her greatest difficulty in a pattern drafting class in the U.S. was in learning to use the customary measurements and tools rather than the metric to which she is accustomed and which she finds more accurate for her use. This brings us to the question of educating groups of our people in the U.S.

Educating the children in our society to be intelligent consumers would be more satisfactory if we were to change to the metric system, because it is based on tens and is a logical, decimal system. A young person could be taught to make calculations easily so the comparing of prices and quantities is quickly understood. With our present system, the units of measurement must be thoroughly memorized and even then the calculations are more difficult to carry out as a young consumer shops and tries to compare values. Some ethnic groups, for example, some of the migrant workers near the southwestern borders of the U.S., have found learning to be intelligent consumers very difficult because of our complicated customary system of measurements.

Because the costs of converting are relatively slight in the women's ready-to-wear area, the benefits of change would far outweigh the costs of changing to the metric system. For consumers, about the only changes which would be necessary would be to become familiar with units for measuring lengths. The tools for fitting and altering women's ready-to-wear garments could easily be replaced with very small expense: just a metric tape measure, a hem marker, and a meter stick.

Even people who are not enthusiastic about changing to the metric system, because of the difficulties in relearning for the adult consumers in our society or because of the costs encountered in making the changes, believe that change to the metric system is inevitable. If this is true and the change is coming sometime, then the sooner we undertake making the change, the better for the consumers. We might as well start right away as soon as careful plans are made for what we want to accomplish; then let us carry out the plans for a gradual, efficient change to the metric system and a convenient, useful structure for sizing and labeling women's ready-to-wear.

DISADVANTAGES AND PROBLEMS IN CHANGING TO THE METRIC SYSTEM

The greatest problem is not in the metric system itself, but is the psychological difficulty of adjusting to something unfamiliar and different. Adults do not like to change. Even though we recognize that our customary system is faulty, we are used to it, accept it, and are content to go on in the habitual manner.

It is considered desirable for women in our society to be small, at least to be slender, and we associate small measurements with beauty. That is why women are flattered and pleased when they think they wear smaller sizes because of sizing in the "better dress" departments. The measurements in centimeters rather than inches would sound large to women, as well as unfamiliar. They may find this psychologically difficult to accept and to become accustomed to, but the adjustment would not require a very long period of time.

For children, learning the metric system would have great advantages; for the older people in our society a good plan for educating them would be absolutely essential. Psychologists and educators as well as researchers would be needed to bring about a successful change if we convert to the metric system.

The units of measurement for lengths are not exactly the same in the metric and customary, so some slight changes may have to be decided upon to make the use of round numbers possible. For example, a pair of shoe laces now measures 22 inches. In metric units should the laces be made 56 centimeters long? Maybe 50, 60, or 55 centimeters would be the best length. Making these decisions and setting standards for women's ready-to-wear would be a time-consuming, possibly controversial, and certainly an essential part of a successful change to the metric system.

It appears that the costs of converting would not be as great in women's ready-to-wear apparel as they may be in some areas. There would be some increases in cost, however, and perhaps some discarding and waste, so the costs of garments may have to go up in the future to cover the costs of the changes. In the long run, the metric system would cause costs of operation to be less, but it may be hard for consumers to look that far ahead. Education of consumers would be important in this respect, too.

Until the change to metric is complete, there is a chance for some confusion and misunderstanding. With careful planning for the women's ready-to-wear industry to change over, this confusion could be kept to a minimum and should not prove to be a serious difficulty.

In talking to various people about the possible advantages and disadvantages of changing to the metric system, it was surprising to learn that many of our citizens are not aware of the possible change. This would indicate that knowledge about the possibilities and problems is not widespread throughout our population. People in general and especially people who are involved in producing, distributing, and consuming women's ready-to-wear, must be alerted and informed about the imminent change, if we are to have the benefit of their thinking and planning for the future.

ACTIONS CONCERNED WITH PURCHASING WOMEN'S READY-TO-WEAR WHICH WILL BE NEEDED IF THE UNITED STATES CHANGES TO THE METRIC SYSTEM

1. Study the procedures used and the results of the procedures in countries such as Great Britain and parts of Africa which have recently con-

verted to the metric system, to learn what to do and what to avoid in the United States.

2. Plan ways of motivating consumers, producers, and distributors of women's ready-to-wear to *WANT* to make the changes which are needed.

3. Agree on how sizes are to be indicated on labeling of women's garments. Ideally, specific dimensions would be shown in metric units of length.

4. Decide on numbers and variety of sizes of garments to offer on the retail market.

5. Change terminology in books, magazines, newspapers, mail-order catalogs and similar publications.

6. Encourage individuals to re-educate themselves to use metric units of measurement.

7. Motivate students, faculties, and associates to learn to use metric units of measurement quickly and easily.

8. Plan for the retraining of sales people and for their practice in using the new metric terms and units of measurements.

9. Plan to educate all parts of our society to be familiar with units, to know the metric system and to practice using it until they become thoroughly familiar with the metric system. Methods used to educate various groups in our society should be varied and appropriate.

10. Work on standards and agree on specific dimensions of garments and on parts of garments and ready-to-wear. This may include standards for materials used in the manufacturing of garments.

11. Set policy for rounding off when units are not exactly the same in the metric and the customary system.

12. Plan for a gradual, but steady changeover to metric. Have a reasonable date set by which the change is to be completed.

PURCHASING CHILDREN'S CLOTHING

(Mrs.) Elsie K. Williams

Textiles and Clothing, College of Home Economics, Iowa State University

INTRODUCTION

For this study, children's clothing has been interpreted as wearing apparel for children from birth through adolescence, to include the entire period of physical growth and development, with full realization of an appreciation for the other areas of personal development which correlate with and are affected by physical growth: namely social, physiological and emotional development. It is specifically concerned with ready-to-wear.

Various methods of obtaining information were used, including a search for literature on the subject that might serve as guidelines. It was concluded from an almost fruitless effort that meaningful studies of the impact and implications of the United States' adoption of the metric system for sizing of children's clothing are nonexistent.

Other methods used for compiling information were: conferences with managers and owners of retail stores directly involved with the sale of children's ready-to-wear; correspondence with various individuals concerned with the clothing industry, both on the manufacturing and distribution level; informal conversations with consumers of different ages with varying backgrounds of experience and education, but who are all presently and actively involved with purchasing children's clothing; conferences with professionally employed people in textiles and clothing, both in education and business; conferences with students at Iowa State University who are majors in textiles and clothing and have had an opportunity to participate in a work-study program conducted cooperatively by the university and various retail-stores; and assistance by two graduate students in their preliminary efforts to: (1) study and evaluate present methods used for sizing children's clothing in the United States and (2) study responses of a group of high school girls enrolled in a class in home economics. (These studies are still in process and no definitive results are available at the present time.)

PRESENT IMPACT

The present impact of the increasing worldwide and domestic use of the metric system is minimal on the consumer of children's clothing. This generalization is based on the following facts:

(1) For all practical purposes children's clothing on the retail market in the United States is sized by the customary system. This is true whether the clothing is produced domestically or is foreign made. Foreign made clothing sizes are converted to the English system before they are sent to the United States.

(2) Few consumers have had any contact with children's clothing sized by the metric system, so obviously they have not considered the possibility of the use of the metric system of sizing children's clothing, much less given any thought to the possible advantages or disadvantages of such a system of sizing.

(3) A small percentage of individuals who have had an opportunity to purchase children's clothing in countries outside of the United States have been confronted with the metric system in clothing sizing. Generally, the sales person is able to make the conversion for them and guide them into buying the correct size. This is another example of America's expecting people from other countries to bridge the gaps in communication rather than doing it themselves.

CURRENT SIZING PRACTICES

In no consumer activity is there greater variety and inconsistency in indicating size than there is in the area of clothing. Vague terms as "small," "medium" and "large" (or the letters S, M, L) are common for designating sizes such as: 0, 3, 6, 12, or 18 months. Another manufacturer may choose 0, ½, 1, 1½ for garments with comparable dimensions. To add to the confusion, a size "12 months" is not necessarily the same as size "1 year." The letter "X" is frequently used to indicate an "in-between" size, such as in a size range of 1 to 3X.

Ambiguous numbers which have *no* relationship to age may also be used to indicate size. A prime example is the sizing of shoes with a range of sizes from 00 to 13, with the age of the child being fitted almost totally unrelated, except for the fact that the larger the number, the larger the shoe. Further classification is made for width by such terms as narrow, medium, or wide. Some manufacturers choose to designate width by letters such as A, B, C. From experience, consumers learn that A is comparable to "narrow," B is comparable to "medium," and C means "wide." More specific and satisfactory size indications for clothing are based on actual body dimensions. These are sometimes used in addition to vague descriptive terms or abbreviations (small, medium and large or S, M, L), or they may be used by themselves. The body dimensions used to indicate size are usually those critical for the particular garment, such as girth for two piece pajamas and training panties, and inseam leg length on creepers or slacks and trousers.

Clothing for infants and toddlers is often sized with an arbitrary letter or number accompanied by a height and weight chart based on the recommendation of the U.S. Department of Commerce [1]. This probably is the best method of size marking presently in use. Similar standards have been developed for Boys, Girls, and Sub-Teen and Teen-age girls, but rarely, if ever, are clothes for these age groups sized by height and weight.

Each manufacturer also classifies its garments for individual types. In small children's sizes the designation is frequently Infants, Babies, Toddlers, and Children. For boys the classification may be regular, slim, husky or robust. Girls' classifications may be regular and chubbie. As the youngster approaches adolescence and begins to experience rapid change in body proportions and size, an entirely new classification becomes necessary. For girls, the range may be pre-teen, sub-teen, teen, hi-teen, junior, etc. Boys may be designated as student or prep. Some numbers or letters overlap in each type classification, so it would be possible—even likely—that a baby, his toddler sibling, his teenage sister and his mother could all be fitted in a "size 3" in various garments.

More examples of the wide range of sizing techniques commonly practiced in the United States could be cited, but those listed should adequately illustrate the inconsistency and confusion that exists.

In an attempt to get some consumer reactions to the system of sizing presently in the use in the United States, mothers of children in various age groups were interviewed. When they were asked if they felt the present system of sizing was adequate, the general reaction was one of surprise—they really hadn't thought much about it. They were used to it and accepted it. Guided by a few leading questions and given time for a little deliberation, they could cite specific instances of inconsistency and confusion, but had given little consideration to changes that would make for improvement. When asked if they felt a change to a metric system of sizing would be a good idea, a very small percentage of homemakers interviewed had considered the possibility but none were familiar enough with what such a change would involve to have a firm opinion. Those who were aware of the possibility of a change had obtained their information through reading articles recently published in newspapers and popular magazines.

These discussions with homemakers were on a very limited basis, and while their reactions may be typical of U.S. consumers of clothing, it would suggest that a broad scientific study would be needed in order to determine how to begin an effective educational program for the consumer on the metric system of sizing.

Correspondence and discussions with people in the clothing industry at both the retail and manufacturing levels indicated that the industry has not progressed much beyond the awareness state in its consideration of what a change to the metric system in the United States would involve.

There are many instances of garments being produced in other countries for the United States market, but all necessary conversions and markings of sizing are done prior to their arrival in the United States. A few large companies have retail outlets outside the United States. Sears, Roebuck and Co., for example, has stores in Mexico and Central America. "Garments for these locations are manufactured to metric specifications issued by Sears and also purchased on the open market—all using metric dimensions [2]."

POSSIBLE FUTURE EFFECTS OF METRICATION

As indicated previously, at the present time the use of the metric system for sizing clothing in the United States is practically non-existent; nor is there any indication of a trend toward a voluntary adoption of the metric system by the industry.

On this basis, it would appear that the clothing consumer in the U.S. will not be affected to any great extent by an increasing worldwide and domestic use of the metric system in the near future if no specific program of coordination or encouragement is undertaken by the Federal Government.

If the United States were to change to predominant use of the metric system, however, it would seem logical to change to a labeling system where size was indicated by critical body dimensions. With such a uniform system, it is conceivable that a child's shoes and socks, or his undershorts and slacks could be a consistent size regardless of manufacturer source.

Sizing clothing is a unique problem, inasmuch as people are not of standard size and proportions. Therefore, it is possible that a change to the metric system could be a disservice to the consumer if we did not retain the essential advantages of our present system. It would be important to the consumer to retain typical classifications of certain garments. These serve as a valuable guide to proper fit, but the size label should also include vital body dimensions. For example, a 13-year-old girl could identify her type (subteen, pre-teen, or teen) by comparing her body size and proportion to type descriptions, (such as those used by the pattern companies), but if actual size labeling was done in terms of specific body dimensions, it would undoubtedly take much of the guesswork out of fitting and help eliminate costly mistakes or extra time required by both the consumer and retail salesperson in finding the correct size by trial and error.

Neither would it be entirely beneficial to force the clothing industry to standardize sizes. Many manufacturers use the Recommended Commercial Standards of the United States Department of Commerce as a guide in their sizing system, but they reserve the right to adapt these standards to their market [3]. Style is an essential factor in the "cut" of a garment, and style is important in sales. For example, one brand of western jeans in the U.S. is famous for its trim style of fit. If the manufacturer had to conform to some standard dimensions set by the industry, his unique "style" would be lost. A comment such as: "I always buy (*brand name*) for my daughter. It is the only one that fits her properly," is not uncommon. It is conceivable that standardization of garment sizing could result in some individuals being unable to ever buy a well-fitted garment. If size could be stated in terms of body dimensions, comparison of brands could be made more easily, quickly, and accurately.

If the United States should change to the metric system, it would be inevitable that some consumer resistance and confusion would be involved, particularly during the early period of changeover, when it is probable that garments would be available on the retail market marked by either system.

Undoubtedly the greatest resistance to a change would be among older consumers who are used to and are generally satisfied with the "status quo," and have not had and will probably never have the opportunity to learn the metric system in a formal educational situation.

Both advantages and disadvantages are foreseeable in a changeover from the English system to the metric system of sizing.

The main disadvantages would undoubtedly be economic and psychological. Some predict that the greatest obstacle to be overcome would be human resistance to change. Learning, unlearning and relearning is always a large undertaking and on a nationwide scale it would be even more momentous.

Undoubtedly the lion's share of the burden of change would fall on the industry itself: in equipment changes, training and retraining personnel, and cost. The consumer would pay ultimately, but how much and for how long, and whether the final result would be more economical for consumers are questions presently unanswerable.

The permanent advantages, however, would appear to outweigh any short-term disadvantages.

If a change to the metric system should become mandatory, it would provide the clothing industry with the need to totally rethink and re-evaluate present sizing practices and to make changes that could result in a more uniform and simplified system. Changing to the metric system would therefore provide the opportunity to "wipe the slate clean" and make a fresh start. Obviously, the same total overhaul could be done with our present system, but it seems highly unlikely that the industry would voluntarily choose to make sweeping changes as long as the customary system is in effect.

The children's clothing market would probably benefit more by a specific and uniform system of sizing than would any other segment of the clothing industry for two particular reasons: (1) A higher percentage of clothing is purchased as gifts for infants and children than for adults [4], and thus there is more chance of costly errors in selecting the needed size, and (2) many articles of clothing for infants and children are prepackaged and purchased without trying on, again increasing the possibility of choosing the wrong size. A sizing system that would reduce the number of errors made in size selection would result in direct savings in time and money as well as greater consumer satisfactions.

There is a trend toward self-service in all segments of the retail market and the clothing market is no exception. Labor costs and the rapid turnover in sales personnel, as well as inadequately trained personnel, are among the reasons for this trend. The advantages of improved methods of size labeling in a self-service market are obvious.

A more adequate system of marking for clothing sizes should also result in a more efficient operation for mail order companies and services. There could be substantial savings in time, money and frustration if consumers could reduce the number of errors in selection of sizes.

A thorough, well-planned and well-executed educational program designed to familiarize the consumer with the adopted system for size marking would be essential prior to the appearance on the retail market of any articles of clothing marked by the new system. An even more vigorous and thorough training program would have to occur with retailers and retail sales people. Well-informed sales people, able to explain to the consumer how metric sizes compare to the customary sizes, could take much of the anxiety out of a new system of sizing for a large majority of consumers.

Conversion charts containing the minimum of essential information, conveniently located for easy reference by both the sales person and the customer would be essential. A number of charts might be needed, depending upon the type of garment being sold. Earlier in this paper the wide variety of sizing systems presently in use was described. Conversion charts would have to relate directly to the type of garment in question, and the size marking system presently in use. One chart that would attempt to show all size classifications presently in use with the metric equivalent for each would be overwhelmingly complicated.

Retaining present type classification of garments would have an additional advantage of helping the consumer bridge the association between the old and the new. For example, a conversion chart would still identify garments by types with the familiar terms of Infants, Babies, Toddlers and Children, but would also include the height and weight associated with each – both in the English system and the metric system.

The clothing consumer would have to replace only a minimum of equipment as a result of a change to the metric system of sizing. A meter stick and a metric tape, each available for approximately a dollar, would provide the consumer with the necessary equipment to take the body measurements needed as guides for selecting correct clothing sizes.

SUMMARY

The advantages of a change to the metric system of sizing appear to outweigh the disadvantages. Consumer resistance could be reduced to a minimum if the changeover at the retail level could be made in the shortest possible period of time, so that the confusion of having both systems in use concurrently will not be prolonged. Previous to the actual change, an all-out effort would be needed to educate and inform consumers as the industry retools and re-educates.

REFERENCES

[1] U.S. Department of Commerce, "Recommended Commercial Standards on Body Measurements for the Sizing of Apparel for Infants, Babies, Toddlers and Children." Pub. TS-5184.

[2] Lowrey, Wm. III., Sears, Roebuck & Company, personal letter, Sept. 16, 1970.

[3] Marques, J. E., "A Comparative Study of Standards for Sizing Children's Garments." M.S. thesis. Texas Women's University, Denton, Texas, 1957.

[4] Brew, M. L., O'Leary, R. R., and Dean, L. "Family Clothing Inventories and Purchases," *Agri. Inf. Bul.* No. 148. Household Economics Research Branch, Agri. Research Service, U.S. Dept. of Agriculture, April, 1956, p. 4.

PURCHASING MEN'S CLOTHING

Margaret Boyle Conte

Textiles and Clothing, School of Home Economics, Purdue University

PRESENT STATUS

The present status of the consumer in purchasing men's clothing seems not to be threatened by customary units nor the international system. A survey of several men's wear shops revealed that domestic garments are labeled in customary sizes as defined by the National Bureau of Standards and imported garments are marked in like manner. Some American sizes relate to body measurements, actual neck or chest girth in inches. Others are symbolic of a series of specified component measurements to which a "size symbol" is assigned.

If the country of origin for the cutting and manufacture of the clothing is on the metric system, the ultimate consumer is unaware of the conversion accomplished for him. Scandinavian sweaters are marked S, M, and L in accordance with American standards. Wool jersey slacks from Italy are sized by inseam and waist measurements. One store buyer who assisted with this paper indicated that a line of suits from Spain are not only marked for U.S. shops, but they are cut as a specific line for export to the United States according to the larger body structure of the American male. The same buyer indicated that none of the metric measurements, conversions, etc. appear on the orders, invoices, or other papers related to the wholesale purchase.

The survey of the retail market for men's wear revealed a predilection for "honest" sizing which may not exist in women's wear. A 36 Long or 38 Short jacket was marked without obvious value judgment on stature. No symbolic colors, letters or other codes were found. The conclusion might be that there is nothing threatening about a size 36 Medium or 40 Short.

EFFECTS OF METRICATION

Since the purchase of men's clothing by consumers revealed no problems related to size and measurement, it seemed important to identify possible difficulties at the production level. Although the National Metric Study Conference Program included response from consumer-related industry at the meeting of September 21-25, the position of the consumer in the market place is contingent on the garment industry.

Two large manufacturers in Chicago revealed that metrication is not an issue at the moment. Mr. William White of Hart, Schaffner, and Marx reported that they utilize the decimal inch which they find advantageous in computer applications. Mr. Dubrow of Kuppenheimer said that metrication is probably in future planning at management levels, but he does not foresee immediate impact in pattern grading, cutting and assembly.

Apparently it remains for the men's wear industry to clarify the place of metrication in that segment and to interpret results to the retailer and consumer. Various aspects of costs of new instrumentation and procedures should be analyzed at all levels.

"The apparel industry thinks the number of sizes offered under the metric system will be a principal disadvantage among other problems, but feels the change should be made eventually despite the difficulties involved," was reported at the Consumer-Related Industry Conference. Members reported concern about retraining personnel, adjusting sizes, record keeping, storage, and conversion of tools and fittings [1].

Projections on metrication include contemplation of a time table for implementation rather than acceptance or rejection of the concept. A bilingual system, hard conversion, or status quo are the alternatives. At the point of consumer purchase of men's clothing there appears to be no advantage to a prolonged period of use of the customary units in combination with metric units. As has been stated, conversion from one system to another is easily accomplished as the market now exists. Labels are so printed. Whether the numbers of sizes offered could be reduced concurrently with metrication is debatable. Fewer choices to the consumer might actually decrease satisfaction. Recent anthropometric studies of American males by the U.S. Space unit at Natick reinforce the diversity of the human condition as well as increased size in general over previous surveys. Until the geneticists standardize the male form, the cause for increased standardization of sizes seems to have little enthusiastic support. David Carlin in *Alteration of Men's Clothing* [2] reaffirms this: "The best experience and training a fitter can have is in the custom tailoring field where partially finished garments are tried on men of every shape and size and adjustments are made." Metrication, hard or soft, would probably exert minimal detriment to the consumer of men's clothing. Compared to effects from other consumer industries it should be relatively nonexistent.

From the Consumer-Related Industry Conference comes the support of soft metrication in the initial stages. Donald F. Martin, director of research, National Association of Wholesale Distributors, recommends serious consideration of empirical evidence before schemes for hard metrication are developed [3].

During the bilingual period many devices and tools could be developed to aid retailers and consumers. Presently banks, travel agencies, and other interested organizations print conversion charts for those who will travel and shop in metric system countries. These may be utilized to show that the men's size 7 hat is in fact a 6⅞ in England and 56 in Europe. His size 10 shoe is a 9½ in England and 44 in Europe. It is disconcerting in the space age to apply an assortment of measures to the male form as geographic boundaries change. Let us call a metric module a metric module and get on with it.

REFERENCES

[1] "Changing to Metric System Not Urgent, U.S. is Told," *Daily News Record*, Friday September 25, 1970.

[2] David Carlin, *Alteration of Men's Clothing*, Fairchild Publications, Inc., New York, 1967.

[3] "Wholesale and Retail Representatives See Metric Base Beneficial for U.S.," *Daily News Record*, Tuesday, September 22, 1970.

HOME SEWING, YARD GOODS AND PATTERNS

Mildred Graves Ryan

The McCall Pattern Company

INTRODUCTION

This paper considers the home sewer from the point at which she selects her pattern through the steps which must be taken to complete the garment to a wearable state. The segments of the sewing industry checked were:

Patterns
Fabrics
Notions
Measuring Tools
Sewing Equipment

The methods used to obtain this information were:

Interviews with home sewers, sewing industry personnel, educational and technical experts, persons who have used both methods of measurement.

Thorough study of both measuring methods by two members of McCall's Meg Carter Service who work with consumers.

Personal experience of over 40 years in the teaching of sewing, writing of books and articles on the subject, consultant to manufacturers, educational director, head of product development and use of the metric system in Brazil.

USE OF THE METRIC SYSTEM BY THE HOME SEWER

In general, the adult home sewer is not familiar with the metric system. Her look is one of bewilderment when questioned about it. Unless she has lived in a foreign country where the metric system is used, she has had no contact with it. She has not even wondered why a "cm" is printed in the seam allowance of a pattern. She thinks only in inches and yards.

The student who sews is introduced to the metric system in science and mathematics classes but usually does not apply the knowledge to sewing. She is aware that another measuring system exists but has not really used it or considered it important.

Some of the items which the home sewer uses are made according to metric units or according to metric engineering standards; however, at the point at which she purchases and uses them, she thinks of them only in inches and yards. She may use trimmings, buttons, buckles, fabrics, ribbons and sewing machines that have been manufactured in countries using the metric system and have, therefore, been made according to metric engineering standards. For instance, Schiffli machines which are used in this country to make some embroidered trims would be based on the metric system. However, these products are offered to the home sewer in inches and yards.

SYSTEM OF UNITS PRESENTLY USED IN HOME SEWING

1. *Patterns:* Inches are used to indicate body measurements for the various pattern sizes. The body measurements established as a standard are summarized into a shorter and more useful expression called a size (fig. 4). Widths of various parts of the garment—hem widths, width at bottom of pants—are expressed in inches.

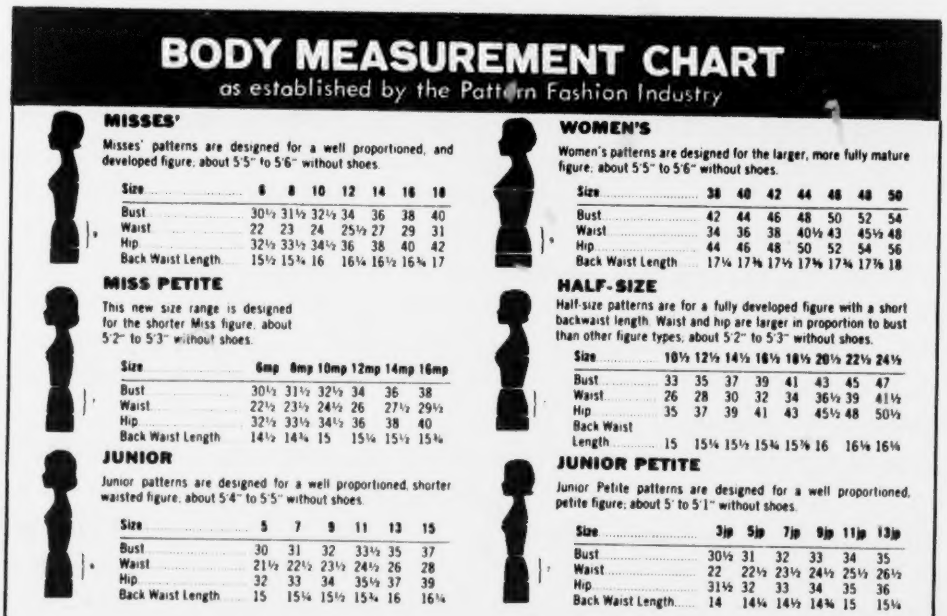
2. *Fabric:* Fabric is produced in a variety of widths expressed in inches. Some of the widths most often used are 35-36", 44-45", 54", 56", 58", 60". Fabric is purchased in lengths according to yards and eighths of yards: ⅛, ¼, ⅜, ½, ⅝, ¾ and ⅞. Knit fabrics are classified by weight in ounces, but are purchased by the home sewer in yards.

3. *Notions:*

a. Thread is measured and labeled by yards but is purchased by the spool. The thread weight is also marked on the spool. The number used represents the number of yards of thread which is spun from a pound of cotton.

b. Seam tapes and bindings: The width is measured in inches and fractions of inches and when the width is labeled, it is labeled ac-

FIGURE 6
PATTERN SIZING CHART



BODY MEASUREMENT CHART

as established by the Pattern Fashion Industry

MISSES'

Misses' patterns are designed for a well proportioned, and developed figure; about 5'5" to 5'6" without shoes.

Size	6	8	10	12	14	16	18
Bust	30½	31½	32½	34	36	38	40
Waist	22	23	24	25½	27	29	31
Hip	32½	33½	34½	36	38	40	42
Back Waist Length	15½	15¾	16	16¼	16½	16¾	17

MISS PETITE

This new size range is designed for the shorter Miss figure, about 5'2" to 5'3" without shoes.

Size	6mp	8mp	10mp	12mp	14mp	16mp
Bust	30½	31½	32½	34	36	38
Waist	22½	23½	24½	26	27½	29½
Hip	32½	33½	34½	36	38	40
Back Waist Length	14½	14¾	15	15¼	15½	15¾

JUNIOR

Junior patterns are designed for a well proportioned, shorter waisted figure, about 5'4" to 5'5" without shoes.

Size	5	7	9	11	13	15
Bust	30	31	32	33½	35	37
Waist	21½	22½	23½	24½	26	28
Hip	32	33	34	35½	37	39
Back Waist Length	15	15¼	15½	15¾	16	16¼

WOMEN'S

Women's patterns are designed for the larger, more fully mature figure; about 5'5" to 5'6" without shoes.

Size	38	40	42	44	46	48	50
Bust	42	44	46	48	50	52	54
Waist	34	36	38	40½	43	45½	48
Hip	44	46	48	50	52	54	56
Back Waist Length	17¼	17⅜	17½	17⅝	17¾	17⅞	18

HALF-SIZE

Half-size patterns are for a fully developed figure with a short backwaist length. Waist and hip are larger in proportion to bust than other figure types; about 5'2" to 5'3" without shoes.

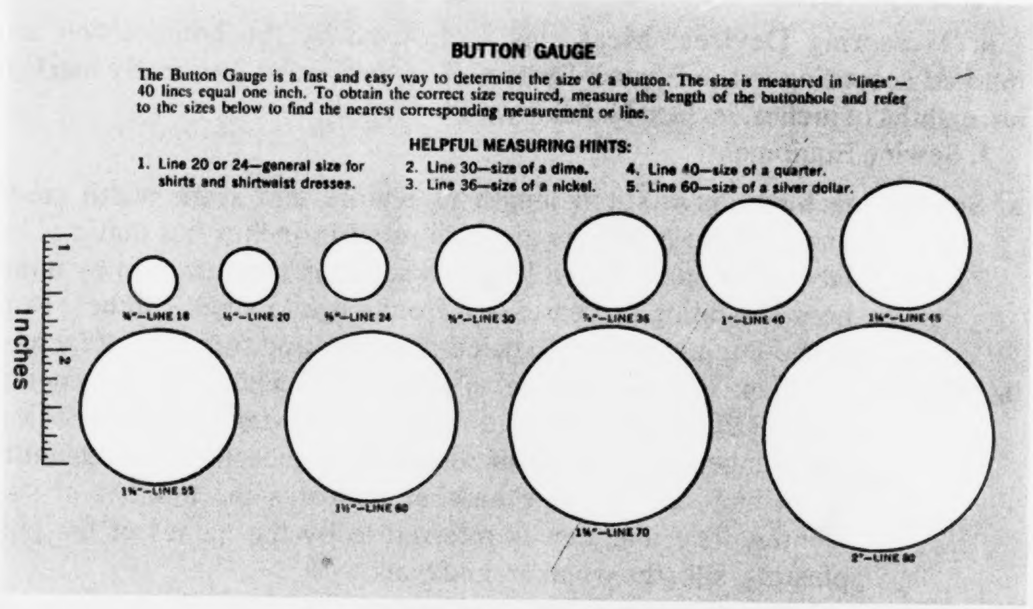
Size	10½	12½	14½	16½	18½	20½	22½	24½
Bust	33	35	37	39	41	43	45	47
Waist	26	28	30	32	34	36½	39	41½
Hip	35	37	39	41	43	45½	48	50½
Back Waist Length	15	15¼	15½	15¾	15⅞	16	16⅛	16¼

JUNIOR PETITE

Junior Petite patterns are designed for a well proportioned, petite figure; about 5' to 5'1" without shoes.

Size	3jp	5jp	7jp	9jp	11jp	13jp
Bust	30½	31	32	33	34	35
Waist	22	22½	23½	24½	25½	26½
Hip	31½	32	33	34	35	36
Back Waist Length	14	14¼	14½	14¾	15	15¼

FIGURE 7
BUTTON SIZING CHART



BUTTON GAUGE

The Button Gauge is a fast and easy way to determine the size of a button. The size is measured in "lines"—40 lines equal one inch. To obtain the correct size required, measure the length of the buttonhole and refer to the sizes below to find the nearest corresponding measurement or line.

HELPFUL MEASURING HINTS:

1. Line 20 or 24—general size for shirts and shirtwaist dresses.
2. Line 30—size of a dime.
3. Line 36—size of a nickel.
4. Line 40—size of a quarter.
5. Line 60—size of a silver dollar.

cordingly. These tapes are purchased in yards and eighths of yards. They are labeled in yards when pre-packaged.

c. Zippers are measured and labeled in inches.

d. Buttons are classified by "lines." In the English System, there are 40 lines to 1 inch. Buttons are often labeled in both lines and inches (fig. 5).

e. Buckles are measured by their widths (the part the belt slides through) in inches.

f. Trimmings include lace, ruffling, braid, embroidered trims, rick rack, novelty trims, edging. These trimmings are purchased by yards and eighths of yards. Often the width of trims is determined by what the designer feels is right for the fashion "look" of that particular season, rather than some scale of measurements. As a result, the width of trims is usually not labeled. When widths are labeled, they are expressed in inches and fractions of inches.

g. Ribbon widths are designated in the industry by "width numbers;" 1½, 2, 3, 5, 7, 9, 16, and 40 are widely used. These numbers have their base in the French system of "lignes" which is probably based on the metric system (though we have not been able to determine the relationship). When labeled, the widths are expressed in "width numbers" (fig. 6). Ordinarily, ribbon is purchased in yards and eighths of yards. Pre-packaged ribbon is labeled in either yards or feet.

h. Hooks and eyes, snaps: The traditional measurement system used for these items does not seem to be related to the English or the metric system. Snaps are available in the following sizes: 4/0, 3/0, 2/0, 0, 1, 2, 3, 4. Hooks are sizes: 0, 1, 2, 3.

i. Elastic widths are marked in inches and fractions, while lengths are marked in yards.

4. Measuring Devices: Measuring tools used by the home sewer are marked according to the English System. The units most frequently marked are eighths of inches, inches, feet and yards.

5. Sewing Equipment:

a. Sewing machines have stitch length regulators and seam width guide lines. These markings are calibrated in inches but may not be labeled as such. Stitch length is sometimes referred to by numbers indicating a progression from large to small stitches. Buttonhole templates are labeled in inches and fractions of inches.

b. Needles and pins: The needle number indicates diameter, but in general, the length and diameter are related. In sewing machine needles, the number refers to diameter. Pins are measured in sixteenths of an inch and the size number indicates the number of sixteenths. The diameter is referred to by the names of the pin: pleating, silk, dressmaker, and bank.

c. Scissors and shears are labeled by the length of the blade in inches.

FIGURE 8
RIBBON SIZING CHART

RIBBON WIDTH		FRENCH LIGNE EQUIVALENTS
No. 1 1/2	▬	**3 1/2**
No. 3	▬▬	**7**
No. 5	▬▬▬	**11**
No. 9	▬▬▬▬▬	**17**
No. 16	▬▬▬▬▬▬▬	**25**

Where the home sewer refers to the various items by their specific units and sizes, she is aided by her familiarity with the concepts these units represent. The home sewer understands the English system as it relates to the sewing in which she is involved. Through her experience in sewing she develops fairly accurate concepts in her own mind as to the length of a yard, the size of a seam allowance (⅝″), and other measurements which she frequently uses in sewing. She also develops a concept of the size and the shape of a person who wears a particular pattern size.

The home sewer does not always use the units and sizes which the industry applies to the various items used in sewing, but instead follows directions which are placed on the pattern envelope for her guidance.

The pattern envelope contains information as to the amount of fabric and the size, lengths, and amounts of notions used for the particular garment. The home sewer's own knowledge and the information on the pattern envelope are used as guides in selecting the items she purchases to complete her garment. Packaging of certain items allows her to buy without thought of measurement in inches or yards.

1. *Patterns:* The home sewer compares her measurements in inches to the measurements on the Body Measurement Chart, also expressed in inches. She understands that if she takes the measurements listed on the chart and selects the size that is nearest to those measurements, she will achieve the best fit for her figure. She has some idea of the extent she will need to alter her pattern where her measurements and the measurements on the Body Measurement Chart do not coincide. She may or may not use the measurements listed for the finished lengths and widths of garments.

2. *Fabrics:* In most cases, the home sewer follows the yardage requirements listed on the pattern envelope. Since fabric is sold in yards and eighths of yards, this is the only way she purchases it. Many home sewers have developed a "feel" for the amount of fabric in yards needed for various types of garments. This "feel" is gained through her experience in selecting fabric for previous sewing projects and through her familiarity with concepts of length in yards. Although knits are classified by weight in the industry, the home sewer does not deal with this concept. She handles the fabric to determine its suitability for her use.

3. *Notions:*

a. Thread is purchased by the spool. The home sewer may or may not know how much thread is on the spool, but many home sewers learn how many spools are required for a particular garment. She may also know that it is more economical to buy a large 500 yard spool in basic colors; the smaller 125 yard spool in unusual colors.

She is probably aware that thread is available in different degrees of fineness, but probably does not know anything about the measurement system used to indicate the fineness. She may know that #650 is the size thread she most often uses and will probably realize that there is a Heavy Duty thread as well as a Carpet or Button thread and will know when it is appropriate to use them.

b. Seam tapes and bindings: These are usually pre-packaged and these packages are labeled by length in yards. In most cases the home sewer follows the width and length suggestions listed on the pattern envelope. She will buy the number of packages which correspond to the amount listed or the amount she feels she needs.

c. Zippers: In most cases the home sewer buys her zippers in the length (in inches) listed on the pattern envelope. Because of her familiarity with inches she has a concept of the various zipper lengths. She knows, too, that zippers of certain lengths will be used in certain places on the garment.

d. Buttons: "Lines" is a term used mainly within the industry. Button sizes are commonly referred to by inches and fractions of inches under the "suggested notions" section of the pattern envelope. At least one pattern company uses both inches and lines. The home sewer is more likely to refer to the button size by inches than by lines because of her familiarity with the inch.

e. Buckles: The home sewer selects her buckles by the width marked in inches or by selecting the buckle size that looks best to her.

f. Trimmings purchased by length: Pattern envelopes list suggested trimmings by inches and fractions for their widths and by yards for their lengths. The home sewer will then buy the amount of trim suggested on the pattern envelope. She may select the width suggested or she may use her own judgment. She will tend to rely on her own feeling about what will look good on her garment rather than to consult the label to see what the width of the trim is; the look is more important than the measurement.

g. Ribbon: Width number designations for ribbon are used mainly within the industry. The home sewer either refers to the pattern envelope which lists the width in inches and length in yards for the required ribbon, or she makes her own decision on the width based on what she thinks looks best. If for some reason she must use a ribbon of a particular width and no other width will do, she will use inches and fractions of inches to make her selection.

h. Hooks, eyes and snaps: Some pattern envelopes list the sizes of snaps and hooks and eyes to be used. In other cases, the home sewer selects what looks best for her use.

i. Elastic: The home sewer buys the width suggested and the number of packages needed to equal the amount suggested on the pattern envelope.

4. *Sewing Equipment:*

a. Sewing machine: The seam width markings on the sewing machine are an aid to accurate sewing. The home sewer who understands how much accuracy in the construction contributes to the proper fit of a garment will use the seam width markings on her machine to insure accurate construction of her garment.

The home sewer learns what stitch lengths (based on stitches per inch) are necessary for a particular fabric and construction technique she is using. She learns to use the stitch length regulator to achieve the desired lengths. Her knowledge of stitch lengths is not too precise, but she has a general relative knowledge and can make acceptable choices. When the home sewer makes worked buttonholes, she determines the necessary buttonhole length in inches and selects the appropriate template marked in inches.

b. Needles and pins: The home sewer is more likely to use her own judgment by looking at the length and thickness of needles or pins than to use the sizes indicated on the package.

c. Scissors and shears: The home sewer may use the listed measurement if someone has told her to purchase shears of a certain size. Otherwise, she looks at the selection and decides which one is appropriate.

CURRENT TRENDS

Since the customary system of measurement is being used successfully in the home sewing industry, the feeling is to continue to use the existing system of measurements. In no part of the industry did we find any trend toward the use of the metric system as far as the home sewer is concerned.

If there is no Federal Government program initiated to change the home sewing industry to the metric system, there would be no motivation to adopt the metric system. The home sewer is using a system of measurements with which she is familiar and which she uses in other areas of her everyday life. It should be remembered that the home sewer generally follows the suggestions given to her by the pattern companies.

If other areas which immediately affect the home sewer changed to the metric system, there would be some impetus for the home sewing industry to change in order to avoid having two measurement systems in use.

PROJECTED USE OF METRIC SYSTEM IN HOME SEWING INDUSTRY

If the United States changed to the metric system, the change would be from yards to meters; inches and fractions of inches to centimeters and millimeters.

1. Body measurements of the pattern sizes would be expressed in centimeters. The pattern company's basic sloper would be changed slightly to measurements that are more conveniently used when expressed in the metric system. Body measurements would be changed slightly from their equivalent in the English system. The home sewer would probably continue to select her pattern in her accustomed size, but the fit might be slightly different.

The same names, such as Misses, Junior, etc. for indicating sizes used in the English system, would be given to the series of body measurements expressed in the metric system which are closest to those previously used in the English system.

In the past, the three major pattern companies in the industry have agreed on body measurement standards and size names in order to make pattern size selection as easy as possible for the home sewer. They worked together to bring about New Sizing 1967 in order to increase the level of standardization in the industry. We can foresee a similar approach in the event a change were made to the metric system.

2. Fabric widths would be expressed in centimeters while lengths would be measured in meters. We assume we would follow the trend in metric countries to divide a meter into 1/10's, ¼'s, ½'s, expressed in meters and centimeters as 1.10m, 1.25m, and 1.50m. This procedure would be followed in listing fabric requirements on the pattern envelopes and in purchasing fabric.

Because of the costly investment in looms and other equipment set for particular widths, fabric widths would probably remain the same and merely be expressed in centimeters rather than inches.

Knits which have been classified by weight in ounces would be expressed in the metric equivalents. However, this would not affect the home sewer.

3. *Notions:*

a. The amount of thread on a spool might be changed to an amount that is conveniently expressed in meters. The amount of thread would be approximately the same and the home sewer would continue to buy her thread by the spool. The weights and lengths used to determine "thread number" could be changed to metric equivalents so that the "thread number" would remain the same as that now in use today.

b. Seam tapes and binding widths would be expressed in centimeters or millimeters and lengths in meters. Prepackaged tapes and binding would probably undergo conversion to more easily used metric units. For example, a three-yard package of seam tape might become a three-meter package.

Tapes purchased by the yard would be measured in meters and fractions of meters as used in fabric measurements. Widths would remain the same but be expressed in centimeters or millimeters.

c. Zippers would be labeled in centimeters. The zipper length would be converted to more easily used metric units; for example, a 10-inch zipper might become a 25-centimeter zipper.

d. The button industry would choose between centimeters and millimeters to express the size of the button. This choice might be determined by what other metric countries are using, and whether or not international standards are developed and used.

e. Buckles would be sized similarly to buttons where the choice would be made between using millimeters or centimeters as determined by common practice in other metric countries.

f. Trimmings purchased by the yard would be purchased by meters in the same way seam tapes and binding would be. Prepackaged trims and ribbons would undergo hard conversion to lengths given in meters. Widths would be expressed in centimeters or millimeters.

4. *Measuring Equipment:* Measuring tools would be changed to lengths more conveniently expressed in metric units. The divisions of space would be expressed in millimeters, centimeters and meters. For example, a yardstick would be replaced by a meter stick; a 12-inch ruler would perhaps be replaced by a 25-centimeter ruler; the 60-inch tape measure would become a 150-centimeter tape; smaller gauges used for such things as marking hem widths would be replaced by conveniently used lengths marked in centimeters; standing hem marker marked in centimeters.

5. *Sewing Equipment:* Sewing guides on sewing machines would be marked in widths measured in millimeters. For example, the widths which correspond to 3/8", 4/8", 5/8", and 6/8" would probably be changed to 9 mm, 12 mm, 15 mm, and 18 mm.

The stitch length would be calibrated in centimeters rather than in inches. The stitch lengths marked on the machine would be chosen so that they could be represented by a whole number. Convenience in use would be a determining factor in selecting the stitch lengths. For example, a present stitch length of 10 stitches per inch might be changed to 4 stitches per centimeter, and 15 stitches per inch to 5 stitches per centimeter.

Buttonhole templates would be marked in millimeters or centimeters, depending on how the button manufacturers decide to mark buttons.

6. *Educational Materials:* Previously written educational materials would need to be revised so that all measurements would be given in the metric system. This would affect all of the home sewing industry as all segments have some educational materials. This could be done as the materials are naturally revised and updated.

EFFECT OF CHANGE TO THE METRIC SYSTEM ON CONSUMERS

In measuring herself and in comparing her measurements with those for the pattern sizes, the home sewer is dealing with much larger numbers in the metric system than in the English. Since today's way of thinking is geared towards thinking young, thinking small, psychologically she may not like the change.

Her thinking now is in inches and yards and she has developed an idea of how big these units are. When it comes to small measurements, such as inches and fractions of inches, many home sewers are so oriented as to distinguish between such closely related distances as ½" and ⅝" when these are not marked. This comprehension seems to have been developed to a fine degree because of her familiarity with the English system.

In beginning to use the metric system, the home sewer would have no similar concepts of lengths and distances in meters. Learning the metric system might be compared to learning a new language. A person would have to translate the new into the old before understanding the new. She would probably want to know how big something was in inches so that she could regain this concept. It would take her a while to develop concepts on length. This time might be influenced by her intelligence, her attitude towards the change, the attitudes of those who are introducing her to it. The salesperson's attitude and ease in using the new system would be very important.

Our experience with a change in pattern sizing from Former Sizing to New Sizing shows that many women are resistant to change, are slow in learning that there is a change (even though there was extensive educational promotion on the change), and are often the victims of misinformation from salespeople and others to whom they talked about the change.

In the case of New Sizing, the home sewer was dealing with familiar concepts and language. In a change to the metric system, she would have to learn new names, measurements, sizes, and completely reorient her concepts of sizes and distances. The industry, however, would be presenting the home sewer with the information she needs to have. The body measurement chart would tell her the measurements in centimeters of the various sizes. Her tape measure would be marked in centimeters. Therefore, she would not need to convert any of the measurements. Likewise, the pattern envelope would inform her of the amounts of fabrics and sizes, lengths, and widths of notions all in the metric system. This is the way she would see the products labeled and would purchase them. However, since she would be resistant to change and would not want to trust her own judgment, she would want some reassurance. She would tend to make matters difficult for herself by wanting to relate these terms and measurements to her familiar inches and yards.

We have not been able to determine any advantages to the home sewer in using the metric system. The home sewer needs some sort of measurement system to assist her in sewing, and the English system being used now fills this need. Sewing would not be made any easier for her if she uses the metric system rather than the English system.

Some of the products the home sewer uses are imported from countries using the metric system. However, they are presented to her just as our domestic products are.

The home sewer comes in contact only with people who talk and think in similar terms. She is not involved in the worldwide aspect of the industry. Home sewing is basically a creative process rather than a precise engineering one; a system of measurement is not of prime importance to her. She is only involved in a system of measurement insofar as it helps her to make her garment.

The measurements she uses are guides to help her in purchasing the correct things and then in putting these together to create a garment similar to the illustration of the finished garment she has in mind.

The greatest disadvantage we can see is that she would not understand the reason for a change and would feel confused. For a while, she would feel that it is difficult to sew due to this change. She would try to continue to use the familiar concepts as long as possible.

EDUCATIONAL EFFORTS

It has been the tradition of the home sewing industry to provide educational materials. Various manufacturers traditionally supply educational materials to stores, schools, and home sewers according to a program which they feel is mutually beneficial. As a matter of course, they would provide educational material pertaining to the change to the metric system.

Positive attitudes about the change to the metric system would need to be developed in the home sewer. This would be conveyed to her by a positive attitude of the industry. She would need to be told specific advantages that would make it important to change to a different system of measurement. This would be difficult because she is satisfied with the present system.

When New Sizing for patterns was being developed, there was a joint effort by the three major pattern companies within the industry to present this change to the public. Working together, the pattern companies compiled a booklet which was distributed to stores and schools for consumer use.

We can see the possibility of such an association to introduce a change to the metric system. This could be through a joint effort of all segments of the home sewing industry or through individual efforts of the various segments of the industry.

There would be a need to develop in the home sewer an attitude that there will not be much for her to worry about; that the industry has done all the work for her. Her basic problem would be in relating these new measurements to concepts that she can easily understand.

The home sewing industry would need to relate the two measurement systems in a meaningful way that would be helpful to the home sewers. It would be helpful to her to know that the meter is just a little longer than the yard; a tenth of a meter is very close to an eighth of a yard; 1.5 centimeters is close to ⅝"; 3 millimeters is about ⅛". She would need to know meaningful relationships rather than conversion factors since the conversions would be done for her by the industry.

There is a general feeling that for some specific time after the metric system is introduced, merchandise should be labeled with the English and metric systems. Merchandise labeled prior to the effective date for use of the metric system might cause a problem. In order to prevent the customer from being involved with that part of the conversion, perhaps it would be possible to have adhesive labels to put on these older packages similar to the labels used for changing prices.

In the case of the change from Former Sizing to New Sizing, it has taken about 3 years for all Former Sizing patterns to be taken from the pattern catalogs and replaced by patterns in New Sizing. During that time, patterns introduced after New Sizing started were marked with special symbols. Pattern sizes were selected according to a New Sizing body measurement chart. The sizes for the other patterns were selected according to Former Sizing body measurement chart. A similar procedure would be followed in changing to the metric system.

There could be two body measurement charts. Store personnel would be equipped with measuring devices and conversion charts so that the home sewer could purchase correct amounts and sizes of fabrics and notions.

The education of sales personnel would be extremely important. She would be the one who would help to reassure the home sewer and to instill in her mind either a positive or negative attitude towards the change.

The sales personnel would need motivational material to understand the change and to develop a positive attitude towards the change. This would probably be material developed by the industry as a whole or by segments of the industry. The conversion charts could be provided in the same way with the particular segments of the industry providing charts which best serve the needs of their particular products.

For example, the fabric segment would be interested in charts which are helpful in converting lengths to meters and widths to centimeters. The notions segment would be more concerned with charts dealing with smaller measurements used for buttons, buckles and zippers. The trimmings segment might be interested in charts dealing with larger measurements in meters for lengths and the smaller measurements in millimeters and centimeters for widths.

If the segments of the industry do not work together to provide this information, then these charts would be provided by the individual manufacturers who have always provided educational materials and consumer information. Printed information could be distributed in stores. The home sewer could receive additional information by attending in-store promotional events. This kind of information would be provided by individual manufacturers in the same way in which they provide educational materials now.

The teacher would need information which would supply her with the advantages of using the metric system. Here again, she would need to develop positive attitudes towards the change. She would be interested in the basic ideas and ways in which she could present these to her students. If the teacher could interest her students in the metric system and could explain the advantages, the students could carry these attitudes and willingness to change to their parents, friends, and neighbors. The students have other contacts with the metric system in their science and mathematics classes. An interested home economics teacher might work with teachers in science and mathematics to develop a good approach to teaching the subject. As soon as it became evident that a change was to be made, education in this subject should begin at the school level.

COST TO THE CONSUMER IN THE EVENT OF CHANGE TO THE METRIC SYSTEM

The items that the home sewer would most likely replace would be her yardstick with a meter stick, her foot ruler with a ruler marked in centimeters, and her tape measure to one marked in centimeters. This should cost a total of about $2.00.

The yardstick, or meter stick, is essential in measuring lengths of fabric and trimmings and is used in marking hems. It is also a helpful aid in laying out pattern pieces on fabric and to make certain that the pattern pieces are on the straight of grain of the goods.

The ruler is used in measuring very small areas, to areas of about 12″.

The tape measure is important in measuring the figure to determine which pattern size is the most suitable. It is used in measuring zipper lengths and openings, trimmings, notions, and buttonholes.

Other sewing aids, such as hem gauges, scallop markers, cutting boards, hem markers, might be purchased as other aids wore out or to facilitate use of the metric system. Average cost of these items would be: 35 cents to $1.25 for a hem gauge, 40 cents for a scallop marker, $4.00 for a cutting board, and $1.50 to $2.50 for a hem marker.

CONCLUSION

My personal experience in the use of the metric system is very limited. While I was in Brazil, I purchased fabric by the meter instead of the yard without any trouble. But when I read in Women's Wear Daily recently that Mme. Pompidou's wardrobe for her trip to Russia "will be totally longuette measuring 39 to 40 centimeters from the ground," I had no exact concept as to where the hemline would be. Was it below calf, mid-calf, below the knee? It was not until I used a meter stick to measure the distance that I realized how far from the ground 39 centimeters really are. It is this lack of understanding which would confront the home sewer.

For the home sewer, there seems no actual reason to change the system of measurement. A change would bring a long period of confusion and frustration. A very extensive educational program would be imperative. A campaign to "think metric" would be necessary.

PURCHASE AND USE OF HOUSEHOLD EQUIPMENT

Mary E. Purchase

Design and Environmental Analysis, New York State College of Human Ecology, Cornell University

INTRODUCTION

This investigation has to do with effects on consumers of a change to the metric system, in particular the effects related to household equipment other than kitchen equipment. Specific appliances to be considered include clothes washers, dryers and irons, vacuum cleaners, heating and cooling equipment such as furnaces and air conditioners, humidity control equipment, water heaters, sewing machines, and personal care items (hair dryers, shavers, heat lamps, etc.).

Until very recently practically all household equipment purchased in the United States was made in this country. Now as manufacturers in other countries find that they have excess capacity and are expanding their markets, we are receiving more foreign made equipment. Many countries, the United States and Canada being notable exceptions, operate all of their electric household equipment on 220-240 volts. We use 110-120 volts for most of our plug-in devices. As a consequence, most electric equipment manufactured in countries presently using the metric system must be manufactured especially for export to the United States or Canada, and it is likely that all the specifications would be stated in equivalent customary units rather than in metric units. At present, the inconvenience of importing from Europe is more related to the voltage differences than it is to the differences in measuring units.

At present Canada and the United States both use customary units and 110-120 volts for plug-in devices. As Canada changes to the metric system, it may be that goods will flow less readily across our northern border unless we also adopt metric units.

UNITS USED WITH HOUSEHOLD EQUIPMENT

The physical dimensions of most of our household equipment are measured in customary units, with inches being the predominant unit. Weight of the equipment is usually given in pounds.

Either set of units, customary or metric, could be used equally well to express the physical size of equipment. In some cases the dimensions of present equipment are such that they can be expressed as whole numbers of inches; in other cases fractions of inches are involved. Except where equipment is built-in, small changes in physical size to change from an integral number of inches to an integral number of centimeters would not affect consumers. Most of the equipment outside the kitchen is not built-in; possible exceptions are washers, dryers, sewing machines, and some water heaters. In most cases where these are more or less built-in, the fit is not so close that a small change would cause difficulty.

In some cases equipment used outside the kitchen is built on the same module as kitchen equipment. If there is a change to metric units, the module should be changed to an integral number of centimeters, and, where possible, the same module should be used for equipment outside the kitchen as for kitchen equipment. The commonly used module at present is 3 inches or, expressed in centimeters and rounded off, 8 centimeters. If an 8-centimeter module were adopted, small changes in physical size of equipment would be needed. A 5-centimeter or a 10-centimeter module might have advantages. These would be nearly equivalent to 2-inch and 4-inch modules in customary units.

After a casual examination of the situation, one might conclude that there was nothing more to be said about household equipment outside the kitchen in relation to metrication. However, additional units, besides physical dimensions and weight, are included in specifications and in engineering standards. Individual consumers are aware of these (table 6).

For the clothes washer, the volume of water used and the maximum weight of clothes for a full load are discussed in consumer literature. Similarly the maximum weight of clothes for a full load in a dryer is of interest to consumers. These are presently measured in pounds, but the measurements are not so precise that they would lose by being converted to the

Table 6. Sizes and Units Used in Describing Household Equipment Outside the Kitchen

Appliance and measurement	Customary units		Metric units	
	Size	Units	Size	Units
Washer:				
Weight of clothes for maximum load.	12	pounds	5.4	kilograms
Volume of water in tub	20	gallons	76	liters
Temperature of wash water	140	°F	60	°C
Power of the motor	0.5	horsepower	400	watts
Dryer:				
Weight of clothes for maximum load.	12	pounds	5.4	kilograms
Rate of producing heat:				
Electric dryer	5,000	watts	5,000	watts
Gas dryer	20,000	BTU/hour	5,860	watts
Power of the motor	1.25	horsepower	200	watts
Water heater:				
Rate of Heating:				
Gas water heater	30,000	BTU/hour	8,790	watts
Electric water heater	1,600	watts	1,600	watts
Recovery rate	30	gallons/hour	144	liters/hour
Thermostat setting	150	°F	65	°C

Table 6. Sizes and Units Used in Describing Household Equipment Outside the Kitchen—Continued

Appliance and measurement	Customary units		Metric units	
	Size	Units	Size	Units
Heating and cooling equipment:				
Rate of heating or cooling	5,000	BTU/hour	1,465	watts
Gas pressure (for gas equipment)	5	inches of water	12.5	newtons/square meter
Flow of air through the appliance	100	cubic feet per minute	2.7	cubic meters per minute
	100	feet/minute	30	meters/minute
Sound	40	decibels	40	decibels
Power of the fan motor	0.25	horsepower	200	watts
Weight (window air conditioner)	100	pounds	45	kilograms
Humidity control equipment:				
Rate of evaporation or condensation	2	gallons/day	7.6	liters/day
Volume of water container	10	quarts	9.5	liters
Vacuum cleaner				
Suction	20	inches of water	50	newtons/square meter
Length of cord	18	feet	5.4	meters
Lighting Equipment:				
Rate of using electricity	100	watts	100	watts
Efficiency of conversion:				
Electricity to light	50	lumens/watt	15	lumens/watt
Illumination	50	foot-candles	5	lux
Sewing Machine:				
Guides	⅝	inch	1.6	centimeters
Stitch length	10	per inch	4	per centimeter
Weight (particularly for portables)	20	pounds	9.1	kilograms
Irons:				
Area of soleplate	30	square inches	195	square centimeters
Weight	4	pounds	1.8	kilograms
Length of cord	8	feet	2.4	meters
Rate of heating	1,000	watts	1,000	watts

approximate number of kilograms. A 12-pound load, equal to 5.4 kilograms, would probably become a 5-kilogram load. The exact amount of water used is seldom measured by consumers. A 20-gallon tub could easily be referred to as either a 75-liter or an 80-liter tub.

One washer manufacturer has designed the lid of the washer to serve as a scale. The calibrations, now in pounds, could be marked in kilograms.

Recommended temperatures of wash water for different classifications of wash loads are given in washer instructions and other consumer literature. These could easily be converted from degrees Fahrenheit to degrees Celsius. The recommended temperature for a hot wash, 140° Fahrenheit, converts to 60° Celsius. Most other round numbers in degrees Fahrenheit do not convert to round numbers in degrees Celsius.

Most homemakers use qualitative descriptions, such as hot and warm, instead of quantitative measurements of water temperature. The few homemakers who measure wash water temperature would likely be the ones who could also most easily adapt to using metric measurements.

The output power of motors is usually expressed in horsepower in customary units; input, when given, may now be expressed in watts. In metric units both would be in watts. Because the power factor of motors is less than one, the input and output are not equal. In metric units it would be helpful to identify whether input or output wattage was quoted. A 0.5 horsepower motor would have an output of 400 watts.

In using washers, some individuals measure the volume of detergent, bleach, and fabric softener. Recommended amounts are expressed in cups in customary units and could be expressed in cubic centimeters or milliliters in metric units. This measurement is usually not so precise that a homemaker would detect the difference between the amounts measured in customary or metric (250 ml.) cups.

The rate of drying, or more precisely the rate of moisture removal from the clothes, is closely tied to the rate of producing heat. Because the homemaker may be more concerned with the output in terms of dry clothes than the input of heat, she may be more aware of the number of loads she can dry in an hour than in the wattage of an electric heating element or the BTU rating of a gas burner. At the time of installation of an electric dryer, an electrician or other trained person must be certain that the capacity of the branch circuit is sufficient for the combined demand of the heater and the motor. Fortunately, the unit of electric power for the heating element, watts, will not change if there is a conversion from customary to metric units. The rating of a gas burner would be changed from BTU's per hour to watts also. Twenty thousand BTU's per hour is equal to 5,860 watts or, in round numbers, 6,000 watts.

Gas bills might state the number of liters or cubic meters of gas consumed and electric bills would be in terms of joules rather than kilowatt hours.

The usual measure for water heaters is the water volume capacity of the tank. Now expressed in gallons, the volume could be expressed in the exactly equivalent numbers of liters or in an approximate number of liters. Tank sizes might gradually change to provide sizes in round numbers.

At the time of selection the consumers may also know the rate of heating the water. In terms of hot water this is the recovery rate in gallons or liters per hour. In terms of energy used, the customary units are watts for electric water heaters and BTU's per hour for gas heaters. A 30,000 BTU per hour burner is approximately equal to a 9,000 watt burner.

Where numbers rather than words are used, the thermostats are now marked in degrees Fahrenheit. In the metric system the units would be in degrees Celsius. The common setting of 150° F would become 65° C.

For air conditioning equipment the rate of cooling is an important measure in selecting cooling equipment of the proper size. Since most room air conditioners are selected by the consumer himself, he becomes involved in using the units to express the size of air conditioner needed. In contrast, when central cooling or heating equipment is being purchased, the builder or a heating expert is usually involved and the consumer may not be particularly concerned with the units in which the cooling or heating capacity is expressed. Air conditioner sizes are designated in round numbers. A so-called 5,000 BTU per hour air conditioner is not likely to be exactly 1,465 watts. New, round number classification would no doubt be selected.

Proper gas pressure must be provided at gas burners for satisfactory operation of the equipment. As we hear about gas shortages during the heating season, we learn that gas pressures may be reduced because of the high demand for gas. This is probably the only time a consumer is aware of the measurement of gas pressure and even then he is not involved in its measurement. Gas pressures in inches of water could be converted to centimeters of water[1] and then would probably be rounded off to an integral number of centimeters.

Fans in heating and cooling equipment are usually rated in terms of the number of cubic feet of air they can move in a minute. This measurement could easily be converted to cubic centimeters, cubic meters or even liters per minute. One hundred cubic feet per minute is 2.7 cubic meters per minute.

Sometimes the velocity of air through a duct or other passage is of interest. The customary units of feet per minute could be converted to meters per minute, with 100 feet per minute equal to approximately 30 meters per minute.

The recent concern for noise in homes has led air conditioner manufacturers to mention sound levels in their consumer literature. Although this is usually expressed in qualitative terms now, manufacturers may begin to express the sound level in decibels. This unit would continue in the metric system.

The weight of window air conditioners is of concern to the consumer who carries one home from the store and installs it. Weight in pounds could easily be converted to weight in kilograms, with actual weights expressed in whole numbers being used. A 100-pound air conditioner would weigh 45 kilograms.

When marked with temperatures, thermostats for air conditioners or furnaces are now calibrated in degrees Fahrenheit. We would have to learn that 77° Fahrenheit is the same as 25° Celsius.

For humidity control equipment the rate of change of the physical state of water is important. For humidifiers this is the rate of evaporation and for dehumidifiers it is the rate of condensation. In either case, the usual measure in customary units is gallons or quarts per day; in the metric system the rate would be expressed in liters per day. Two gallons per day is equal to 7.6 or approximately 8 liters per day.

Anyone who has let the water container on the dehumidifier run over knows that the capacity of the pan is important. Now expressed in either quarts or gallons, in the metric system the capacity would be expressed in liters, with a 10-quart capacity equal to a 9.6 liter capacity.

---

[1] Many terms are used to express pressure in the metric system: The newton per square meter is the only acceptable terminology, however, recognized in the moderized system.

Besides the physical size of the vacuum cleaner, consumers may be concerned about the length of the cord. Now expressed in feet, it could easily be expressed in meters. An 18-foot cord would be 5.4 meters long. Some consumer literature or specifications may include a measure of the suction, but I believe that few consumers are aware of that measurement.

For lighting equipment the wattage of the lamp is practically the only measure with which consumers are concerned. The efficiency or lumens per watt was discussed for a brief period of time in some consumer literature, but consumers are not generally aware of that measurement. The units, watts and lumens, would be used in the metric system also.

Recommended levels of illumination, such as the illumination recommended for studying or for casual conversation, etc., is now expressed in footcandles. In the metric system the unit would be the lux. A recommendation for 50 footcandles might become a recommendation for 5 lux.

Sewing machines frequently have guides marked to help in maintaining a constant seam allowance during stitching. The guides are now labeled in inches but would be labeled in centimeters in the metric system. A ⅝-inch seam allowance would become a 1.6- or a 1.5-centimeter seam allowance. The number of stitches per inch would be counted as stitches per centimeter, with 10 stitches per inch equal to 4 stitches per centimeter. Sewers using clothing patterns with directions in customary units and machines marked with metric units or the reverse would have to convert measurements from one system to the other.

The weight of a portable sewing machine would be of concern to consumers. A 20-pound sewing machine would weigh 9.1 kilograms.

For hand irons two measurements are recognized by consumers: the area of the soleplate and the weight of the iron. In customary units these are measured in square inches and pounds; in the metric system the units would be square centimeters or square meters and kilograms. An iron with a soleplate of 30 square inches would have a soleplate area of approximately 200 square centimeters. A 4-pound iron would weigh less than two kilograms. The length of the cord is also of interest, the units of measure being feet in customary units and either meters or centimeters in metric units. The unit for expressing the rate of heating, watts, is the same in both sets of units.

With regard to personal care items, such as heat lamps, shavers, hair dryers, and electric toothbrushes, metrication would cause no problems for individuals. Physical sizes of these appliances are not standard and, just as at present, there would be no need for the appliances to conform to uniform dimensions.

Of the units used in the above measurements, watts and hours would remain the same in a change from customary to metric units. Consumers in general may be unfamiliar with meters, liters, and kilograms. For equipment outside the kitchen, however, only a limited number of consumers have in the past been concerned with many of the measurements, other than physical dimensions, discussed earlier. Therefore, except for the physical dimensions, the conversion to metric units would have little effect on most consumers. The small proportion of consumers who in the past have been concerned with other measures than physical dimensions are probably the better educated consumers and they may already have some familiarity with the metric system.

The problem of service and replacement parts during metrication has the greatest potential for problems. Some tools such as wrenches are made to fit a particular size or part; these may have to be changed as metrication progresses. When the standard for parts such as screws is changed, new parts would have to be stocked. In addition, parts and tools with standards based on customary units would also have to be stocked until present appliances were discarded. Duplication of tools and some simple parts would affect home handymen as well as appliance servicemen.

POSSIBLE FUTURE EFFECTS OF METRICATION

A desire on the part of industry to make equipment acceptable in countries already using the metric system, with a minimum of alteration, is encouraging use of the metric units in engineering standards. For example, the proposed revision of the American National Standards Institute standard for electric ranges includes, in parentheses, the metric equivalent for all measurements given in customary units.

Without Federal Government encouragement the trend toward metrication would no doubt continue in industry. Whereas industry can clearly see an advantage to increased metrication, I doubt that present consumers see any benefit to themselves. To appease the consumers, manufacturers may continue to use customary units in consumer literature, unless there is some outside force urging consumers to accept the new units.

Throughout the early part of the paper and in table 6 suggestions were given for conversion from customary to metric units. Except where a particular module is being followed, no particular size is recommended over another. As designs change, specifications change; and where measurements are now expressed in either integral or round numbers in customary units, in the future, where convenient, the size could be such that measurements would also be expressed in integral or round numbers in the metric units.

As stated earlier, except where equipment is built-in or must fit exactly, the consumer may never be aware of actual changes in sizes to provide integral or round numbers if the change to metric units occurs at the time of other design changes. Therefore, there would be neither advantage nor disadvantage in changing sizes as far as the consumer is concerned except for the advantage of using integral or round numbers.

If metrication is increased, no special education will be required for purchasing and using equipment outside the kitchen other than the education for purchase and use of kitchen equipment or for general use of the metric system. Education in use of metric units at all levels should begin as soon as possible. Where needed, workshops should be planned to help teachers understand and use metric units. Workshops for individuals engaged in formal and informal education would be particularly important. Much of the informal education of consumers would be through mass media.

Conversion charts for length, weight, volume (as for liquid measurement), and temperature would be most important. Of more limited use would be conversion charts for heat measurement. Very limited use would be made of conversion charts for illumination.

Aids for converting one unit to another could be in the form of tables, graphs, or slide rules, with individuals selecting the form most useful to themselves. Tables and graphs could be published in magazines, newspapers or other consumer literature. Inexpensive slide rules could be sold or distributed free by consumer groups.

A planned program of metrication over a period of years with a definite target date for changeover to be completed is encouraged. The ultimate advantages of using the same measuring system as the other major countries outweigh the disadvantages related to the change.

Also encouraged is hard conversion, with standardization on metric based modules. Changing the size of modules will cause some problems. It will be difficult in some cases to put new equipment into the space formerly occupied by equipment built on a module using customary units.

Because of the interrelatedness of appliance size, cupboard size, and standard measures in house construction, etc., a well thought-out time table for conversion rather than hit-and-miss, evolutionary change will be necessary. If consumers and others knew when the change to metric units would occur in a given segment of industry, they could use this information in their planning. The time table should be such that the dates for change to modules based on metric units could be included in long-term as well as short-term planning by industry.

In talking about the possibility of metrication one consumer said, "It may be hard on the present generation, but think of the benefit to all future generations."

Another consumer who had just returned to this country after living in Europe for several years said, "The sooner, the better. We have waited too long already."

HOUSEHOLD FURNISHINGS

Stanley Slom

Home Furnishings Daily

INTRODUCTION

Ask any number of home furnishings retailers, manufacturers and association executives about the advantages of the metric system at the consumer level, and most will respond with only the problems they run into. They'll also tell you consumers are perfectly happy with the way manufacturers and retailers treat them today. Besides, the consumers don't know anything about the metric system, nor could they care less, if you can believe manufacturers and retailers.

Businessmen almost always look at the pessimistic side of anything new. They look only for the problems it will create, and point out that any blessings will be outweighed by the disadvantages.

For instance, 5 years ago furniture manufacturers were asked how important a role plastics would play in furniture. Practically all of them responded that theirs was a wood-oriented furniture industry and customers would not accept plastics. Of course, they were thinking of plastics as a cheap substitute for wood and not as an entirely different form and use.

Today, practically every major furniture producer in the North Carolina-Virginia area, where more than half the furniture in the United States is made, has either opened his own plastics molding factory or has contracted with someone else to make a line for him because of the demand for rigid molded furniture by consumers.

When latex foam rubber and subsequently urethane foam came on the market, furniture manufacturers rejected them because they thought these products would not be accepted by the quality conscious consumers. Today it is almost impossible to buy upholstered furniture without either latex or urethane foam.

Another example: 5 years ago the cotton people were very smug about sheets for bedding. Nothing could dislodge king cotton. Today, we have a predominance of blends for permanent press sheets. Cotton is out.

I mention this information about resistance to product or material innovations because in talking to industry sources I found that many were the same people who said, "Forget metrication in home furnishings."

METRICATION IN HOME FURNISHINGS

Let's start with floor coverings, which could probably be the major product to be affected by measurement in home furnishings. Floor coverings are made and sold by the yard. The looms are either 12- or 15-feet wide and this is a historic fact. However, consumers measure their rooms by the feet and inches. Architects and contractors almost never design or build a room to measure 12- or 15-feet to accommodate the floor coverings industry.

Thus, we have a consumer going into a store to buy enough floor covering for a room 13 feet, 2 inches by 15 feet, 7 inches, and a salesman shows her a floor covering made in widths of either 12 feet or 15 feet and sold by the square yard. To multiply 13 feet, 2 inches by 15 feet, 7 inches to get the square footage and divide it by 9 to get the square yardage needed is a cumbersome problem. Then multiply by the price per square yard, and you have completed the calculations.

The response of one of the major retail executives in the metropolitan New York area was simple: "Look, how often does a consumer have to go through this measurement in covering his floor?" Besides, he said, his store usually has available a chart giving some examples of room dimensions in feet and showing consumers how to get an approximation of how many square yards in a room so that it can be priced. Unfortunately, not too many stores care enough to do this.

As mentioned before, looms are made to produce carpeting in 12- and 15-feet widths. Manufacturers indicated that either we discard the present looms, or we make carpeting in their present widths and sell them by the meter. This means that we would be selling carpeting in widths of 3.66 or 4.575 meters.

Now that the "insurmountable" problems related by the people in the business have been presented, the positive side of how negligible these problems really are can be stated.

Heugatile Corp., a Dutch firm which manufactures carpet tile for the U.S. commercial market, makes its tiles in measurements of 50 by 50 centimeters which the company says approximates 20 × 20 inches (19$^{1}/_{16}$ inches). These are packed 20 squares to a box, or 5 square meters. This measures exactly 6 square yards. There has been no problem in merchandising the carpet squares on the metric basis.

Let's take another positive example of what can be done!

Back a few years, air conditioners were sold by the ton. They were referred to by 1-, 2-, or 3-ton units, all of which meant nothing to the consumer. The units certainly didn't weigh 1, 2, 3, tons; it takes 12,000 BTU's to cool 1 ton of water so many degrees. This terminology was not satisfactory even if a unit was 12,000 or 6,000 BTU's, or 18,000 or 24,000 BTU's or anything that was divisible by 12,000 units. But what happened when you had 7,000, 13,000, or 19,000 BTU's? The manufacturers rated the air conditioner as close as they could to the next ton. In order to make a more accurate rating, it became necessary to use BTU's (British Thermal Unit is the quantity of heat needed to raise the temperature of one avoirdupois pound of water one degree Fahrenheit.)

There was much gnashing of teeth and beating of breasts by manufacturers and retailers, but the conversion was done without incident. It is now an accepted measurement although many people may not know or care how many units of heat are needed to raise the temperature—especially when all they are interested in is lowering the temperature.

There are other facets of home furnishings that should be mentioned. Tables, sofas, consoles, and beds are all measured by the inch. If we convert to the metric system, there should be no problems once the consumer has adapted to the system. Upholstery fabric, much like carpeting, is sold by the yard and is made in a standard width of 54 inches. This comes to a standard width of 138 centimeters. Looms could be changed to 140 centimeters.

Curtains and draperies are measured by the inch. Like carpeting and upholstery, it comes in standard widths, these being 36, 42, 45, and 48 inches, which could necessitate changing the loom widths so that they would come out to an even metric width. These widths, however, are not completely precise and simple conversion and rounding could be satisfactory.

Mattresses, too, are measured in inches as are the sheets and blankets that cover them. The only confusion currently existing here that could be helped by conversion to the metric system is that we measure ourselves by feet and inches and we buy mattresses only by the inch. But this is not a major problem.

In summary, there is a critical need for standardized measurement in floor coverings because of the problems of manufacturing and selling by the yard, and making actual floor measurements by feet and inches.

Conversion can be made though there is resistance, just as conversion was made in the air conditioning industry.

REPAIR AND SERVICING OF HOUSEHOLD EQUIPMENT

Henry N. Ostborg

Electro-Mechanical Division, Merchandise Development and Testing Laboratory, Sears, Roebuck and Co.

INTRODUCTION

The task that the United States Congress has delegated to the National Bureau of Standards in regard to metrication is one of extreme importance – not only to individuals, or even to companies vital to our national economy, but to our country and its position as a world power.

Sears, of course, is not a manufacturer. We are in the retailing business – furnishing goods and services to the consuming public. However, we are intimately concerned with manufacturing problems and needs because they affect the costs of building our products to our specifications. Thus, our interests encompass the full spectrum of the American economy. Sears necessarily would be deeply involved in and concerned with a move as drastic as that of changing our national measurement system and the introduction of a new language.

Our dealings with countries employing the metric system of measurement represent a small portion of our total business, even though we have stores in Latin America, Spain and Canada and buying offices throughout Europe and in the Orient, and even though our foreign purchases of goods often are an important element in that country's economy.

The export of goods to our foreign operations is limited by restrictions placed on the quantity of imports and by tariffs that place American-made goods in a noncompetitive position. Here, too, the difference in measurement system has little effect.

So we work closely with manufacturers in those countries where we have stores, in order to establish control disciplines that permit us to buy products built to our specifications; these products necessarily adhere to American standards married to whatever local requirements are in force. The result? Distinctive Sears goods. And if the country in question employs the metric system of measurement, then our products are usually specified and built within that system.

Imports of foreign-built consumer goods are dictated by clear-cut business factors. Perhaps the cost of making an item in the United States is noncompetitive with the landed cost from a foreign manufacturer. Or the item(s) may be indigenous to a particular country or part of the world, and thus may carry a special appeal for the American consumer. Or, in some cases, the required engineering and/or technical knowledge may be more readily available elsewhere than in the United States.

When planning a foreign purchase, Sears works closely with the foreign manufacturer to establish product performance and quality standards deemed necessary for our domestic market. We buy according to the measurement system of the country of origin; and in practically all instances of note, this would be the metric system. Goods purchased this way include complex mechanical items like sewing machines, typewriters and adding machines, as well as less complicated products such as hand tools and decorative items.

The metric dimensions of these purchases have produced few problems within our selling and servicing function, and, to our knowledge, they have had no impact on our customers.

SEARS' ATTITUDE

Our country has been moving steadily into a metric environment. Some companies, notably in the pharmaceutical industry, are already using the metric system almost exclusively. A growing number of others—among them Sears—are using it in some phases of their operations.

We believe the near-total adoption of the metric system by the United States is inevitable. It is only a question of how long it should take and deciding how the transition is to be implemented—recognizing full well that certain areas may never change.

The question of the importance of such a move to a company like Sears can be answered affirmatively only if the view is long range. In those areas where it is best for Sears to carry goods built to metric specifications, we have assimilated them into our system with a minimum of difficulty. If the demand for these and additional items increases, we are confident—based on our experience—that these new products also could be sold, serviced and maintained with relative ease.

On the other hand, in order for the United States to continue to be an important factor in the world markets and to maintain a favorable balance of trade, it would appear imperative that metrication be adopted. If this were to have the anticipated favorable influence on our national economy, then Sears' economic position would also be favorably affected.

Where there is an economic motive to learn a new measurement language and use dual dimensioning, we foresee no unusual problems. But from those who have no readily visible and easily defined economic motivation—such as the American consumer—we would expect considerable negative reaction. To us, this merely stresses the overwhelming need for a well organized, carefully implemented educational program. Such a program would require input from all branches of industry, our schools, and all levels of government—local, state and federal.

REPAIR AND SERVICE

The effects that changing our national measurement language would have on the repair and service of consumer products depends on the areas involved. Sears experience indicates that these areas would include the installation of products at new locations, the replacement of existing equipment, the repair and service of any and all products in use, and the furnishing of parts for repair and normal maintenance by the customer.

The problems that Sears would face are largely contingent upon the rate at which the language change would take place, and upon the effectiveness of the educational programs conducted for both the customer and the service personnel.

If the time for the change to metric were suddenly decreed to be tomorrow, allowing time only for a crash educational program, there would be utter chaos. Customers and service people alike would be unable to cope with the resultant problems. On the other hand, if the program were to be formulated on the indefinite basis of "let nature take its course," confusion would still occur in many areas, resulting in unwarranted duplication of effort, repair parts and tools, and ultimately, higher costs. Thus, it is necessary to plan a reasonable rate of change.

If this rate of conversion were made to fit the changes brought about by normal product design innovations and improvements and/or the improvement or replacement of manufacturing equipment or methods, then the duplication of repair parts inventory could be held to a minimum. Further, the training of sales and service personnel could be accomplished as a part of the normal training necessary on any product change, minimizing confusion and total cost.

THE PROBLEM WE'D FACE

Let's take a look at the magnitude of the assignment that a company like Sears would face. Then we can more realistically measure the problem areas and draw some conclusions with regard to the time factor involved.

Sears employs more than 18,000 service men, based at 2,000 locations. These people receive their training at five centers located around the country; last year, 13,000 Sears employees were enrolled at these centers.

In addition, 8,000 home study courses were conducted, plus the on-job training that is received at our retail store and parts depot levels.

We stock more than 600,000 repair parts. This permits handling the major portion of service needs at the store level. Back-up stocks in the supply depots and at the factory allow full coverage of parts needs. Our service men use 12,000 trucks carrying a stock of replacement parts that cover the major portion of routine service calls. This tailored truck inventory has served to cut repeat calls drastically, and consequently, to increase customer satisfaction.

In addition, the trucks are equipped with all the standard tools, plus some sophisticated equipment needed to assure correct diagnosis of malfunction. (For example, the instrumentation for radiation measurement of microwave ovens is currently under study. If we are going to be in this business, we must know how our merchandise is functioning and what level of safety it is providing the user.)

Obviously, considerable time and money must be spent by any company providing services to the consumer, in order to be sure that such services will be rendered meaningfully.

What impact would the change to the metric system have on our service costs? If the additional tools needed—wrenches, gauges and measuring tools—were to cost as little as $100.00 per man, this alone would represent a cash outlay of almost $2,000,000, without taking into account the cost of revising service manuals and other educational materials that would be required.

REPAIR PARTS INVENTORY

Let's look at another facet of the total repair and service function—that of repair parts inventory. Simply stated, Sears policy is that repair parts are available as long as a reasonable demand exists. The demand element is predictable—based on the history of similar items and the estimated life of the product.

The average product life estimates for mechanical items can vary from 5 years for a power lawn mower, to 15 years for a refrigerator or a range, and up to 30 years for a sewing machine. The "life" factor is influenced by the environment in which the product has to live and the duty it must perform. Thus, the lawn mower exposed to rough usage and adverse storage facilities is bound to have a far shorter life than is a well-cared-for sewing machine that is used only occasionally.

Having committed ourselves to providing service for what we sell, and for a reasonable product life, how does this influence our views on metrication? Although it is not Sears' prerogative to establish a fixed time period for conversion, we do recommend that consideration be given to avoiding a crash program and allowing sufficient time for all concerned to adjust easily. We believe that even 20 years is not unrealistic, though some phases of conversion could be accomplished quickly. This would permit an orderly control of repair parts inventory, with the major impact absorbed into normal model changes, allowing us to go with minimum confusion from a change of language to a true design usage of metric measurements. In like fashion, training of personnel could be carried out as part of the normal routine.

But let's get down to specifics.

Since our replacement parts are identified by name and number, we do not anticipate extreme confusion in measurement language. In other words, someone requiring a side panel for a gas range, part number 10076, would not care whether the dimensions were standard or metric, only that the part fit easily and quickly into place.

Expected problem areas include fasteners where the intermixing of two systems would be wrong—screws, nuts and bolts—and parts where fit and tolerance are critical, requiring new tools and gauges.

The home mechanic, unless he were only a hammer and screwdriver man, would have to add to his tool chest to be equipped to handle the old as well as new equipment.

Some items have long life, such as a home well water system. The replacement of a component (pump or motor) would necessitate long-range planning for the provision of suitable adaptors and/or the continuance of compatible designs.

EDUCATING COMPANY PERSONNEL

In the advent of a formal metrication program, the task of internal company education alone would be immense. Sears employs more than 400,000 people during peak selling periods. Reaching these people with just the bare essentials of the new measurement language—considering the printing of informational pieces and the man hours involved in communications—would impose a heavy cost. People in all areas of operations would need some input.

Salesmen would have to be able to assure the customer that a 762 mm range will fit the space in her kitchen vacated by her old 30-inch model.

Service technicians would need dual language knowledge where fit and tolerance specifications are important for correct product functioning, and would have to be able to identify both metric and standard fasteners.

Space planners would have to lay out store selling areas—including counters, fixtures, selling aids and lighting—as well as order and purchase in the new language.

Advertising staff would have to describe products in the new language as a part of the general public educational program.

Management at all levels would have to know the new vocabulary and its significance in order to maintain good communications and effective control.

Product planners, from an engineering design standpoint, probably would have one of the easiest transition areas. However, when the marketing and manufacturing inputs necessary for successful introduction of a new product are considered, the lines of communication and understanding can become tenuous.

Only a few groups have been discussed here, and the coverage of each was brief, but perhaps it serves to demonstrate the magnitude of the problem. There is no way to measure the potential cost of conversion. We can conjecture with reasonable assurance that it would be high if the entire program had to be accomplished on a tight schedule. Spread over many years, the cost could be absorbed gradually, and each new phase would become progressively easier.

CONSUMER EDUCATION

However, the external phase of education, that of communicating with the customer, is a problem of far greater magnitude. Sears has throughout its history maintained a dialogue with its customers, wherein it has conscientiously attempted to make them knowledgeable consumers in the areas of value, performance, service and repair, and safety.

There is no economic incentive for the customer to learn a new measurement language, and we would expect to face attitudes of apathy and even resentment. We, as any other American business that is in direct communication with its customers, would need supporting aid from many quarters—with particular emphasis on a federal program. This cannot be accomplished overnight. The resistance to change will be high, especially in people who have completed their educations and face daily the problem of earning a living.

Consider the elements of communications with the customer, and you recognize that all these will have to be expanded to present the case of the new measurement system and the understanding of the dual language. Customer literature of all kinds—sales promotional pieces, fact tags, instructions covering operation, maintenance and/or assembly, recipe books, repair parts lists, and advertising copy, to name only a few—would have to carry specific educational information over and above what is included today under the standard system of measurements.

We mail millions of catalogs annually. Anyone who has thumbed through a Sears catalog cannot help but appreciate the magnitude of the task of using the dual language, and the added copy that would be required. We do recognize, however, that such media can play a major role in consumer education.

The adoption of an extended period of transition to the metric system would permit coping with this and allied problems in a gradual, easily assimilated fashion and consequent spreading of the costs over a more equitable time period.

We don't generally think of the consumer as responsible for service or repairs of a product, other than arranging for, waiting for and paying for the call of a service man, although we frequently describe in detail how the "handyman" can effect some repairs and provide routine maintenance. The customer, or ultimate user, however, is responsible for recognizing the existence of a problem and describing the problem when requesting service.

Service requests can be as uninformative as, "My machine won't run" or as explicit as, "My model 3600 automatic washer fails to fill with water when set for white clothes." Attention to the latter request could be fast and efficient, while the former could require two or more service calls.

Customers need adequate information to handle their service responsibility and needs, and to help them, virtually millions of communications efforts are produced annually by Sears to provide the consumer with information. But our customer profile parallels very closely that of the United States population; the education level varies from less than eighth grade to advanced degrees, income levels range from less than $3,000 to more than $15,000, and occupations vary from teenage students through tradesmen and management and executive personnel.

And one language must be understandable to all. How?

First, dimensional terms of the standard system of measurements used today have universal understanding to consumers of all educational levels.

That is, refrigerator and cooking temperatures are expressed in degrees Fahrenheit—a 350°F oven and a 0°F freezer—and understood by all.

And everyone uses the same linear dimensions—¼ inch of frost accumulation in the freezer, 8-foot extension cords and 6 yards of fabric.

We all know what a mass measurement like 10 pounds of laundry means, or 6 ounces of meat per serving.

It is the same with volume measurements. We all understand ounces or cups of laundry additive, pints or quarts of cookware capacity, and gallons of laundry fill capacity.

Since the introduction of a new dimensional language appears to have no obvious advantage for either the consumer or the communicator, several problems become apparent. Some of these will be of short duration and are related to the actual conversion. Others are of long duration and are related to the actual use of the new language.

An easy transfer from the standard to the metric system could probably be accomplished in temperature and mass dimensions. Other than the initial confusion of change, the conversion is straightforward and easily rounded off, requiring only familiarization with the new terminology and religious labeling of the system.

Linear dimensions present slightly greater adjustment in making the conversion and in use, as the foot has no direct corresponding dimension in the metric system and would result in decimal equivalents.

Volume dimensions would appear to be the greatest challenge for both consumer and communicator. The relationship between ¼ and ½ cup (using an 8-ounce cup) is more quickly grasped than that between 0.059 and 0.118 liters.

So the problem in the educational area becomes one of determining all the problem areas of dual dimensioning; determining the problems of acceptance, rejection and confusion of the consumer; and programming for as long an evolutionary stage as necessary.

Sears stands willing to help the National Bureau of Standards and the Congress of the United States in any way it can in the planning of a metrication program from a retailer's viewpoint, and to work in all facets of our own business to provide a smooth and orderly transition.

But we hope that the needs of the consumer would determine the pace, and that all would be alert for those industries that dig pits for themselves.

Above all, let's not be stampeded by a "now is the time—let's go!" attitude.

AUTOMOBILE PURCHASING AND USE

Harry Murphy

Department of Marketing, University of Dayton

INTRODUCTION

This paper will explore some of the implications of metrication for consumers in their purchase and use of automobiles. It is in the role as a consumer, not as a professional in education or marketing, that these thoughts are offered.

There seems to be little more than varied opinions (or speculation) by way of data available which can be brought to bear. The literature is quite sparse, quite opinionated, and very redundant. The remarks made here are based on personal experience as a consumer, observations of consumers, some interviews with automobile users and dealers, and a review of recent periodical literature.

MARKETPLACE PRACTICES

It appears that the rapid increase in the number of automobiles imported from countries using the metric system has presented relatively few measurement type problems for consumers. The producer-seller provides purchase and use information converted into the customary (inch-pound) system. When metric measurements *are* used, they seem to represent a sort of elitist approach for a group of "afficionados"—hence a means of communicating among a small group with specialized interests. Any chain reaction type of behavior by which this group would beget other such groups, and eventually result in understanding or adoption of the metric system by the bulk of auto purchasers and users is not foreseen.

Competition in the marketplace seems to mandate that metric information be converted into the customary system—at least that information must be converted which the seller perceives as useful in bringing about a favorable buying decision.

ADAPTATION AND CONVERSION

If customary engineering standards are retained as they would be in a modified approach, it would be necessary to convert our customary system of measurements into metrics. Taylor [1] called this the metric unit approach and Odom [2] seems to have this in mind under his term of adaptation. That there would be problems of understanding, communication, and education for consumers can be illustrated by recognizing the consumer's problems in converting the simple and frequent question "How many miles per gallon? into "How many kilometers per liter?" The gallon becomes 3.8 liters and the mile becomes 1.6 kilometers.

A study reported last year in *Science News* [3] is germane in revealing that gradual replacement and redesign generally result in complete replacement of parts in an automobile in about 12 years. In other words, a 1971 model automobile is not likely to have any of the parts used in a 1958 model. William K. Burton of Ford Motor Co., Chairman of the Industry Subcommittee of the Metric Advisory Committee of the American National Standards Institute, reflects this in his estimate [4] that the automobile industry would require 15 to 20 years for a changeover to metric standards.

If a dual system of measurements were used during this changeover period to the extent that customary engineering standards were retained, it is clear that the customary system expressions would be both simpler and more familiar.

Hence the dual system of including the measurement expression in both customary and metric terms if customary standards were retained would probably effectively result in continued usage of the present customary system. This would seem to be true until the withdrawal from the dual system to a use of only metric expressions.

The metric expression in such a dual system would presumably be little used by consumers; yet would engender much confusion. One may question if such a modified approach in which metric expressions are used but customary system engineering standards are retained would achieve the benefits claimed for metrication. Increased selling power in world markets and the consequent reduction in gold outflow as well as increased efficiency in production would seem to assume the adoption of metric engineering standards as well as metric measurements. Odom [5] refers to this as conversion. The new engineering standard would be expressible in round numbers in metric measurements. For example, the 110 in. wheelbase with a metric equivalent of 279 centimeters might become 280 centimeters. Taylor [6] is of the opinion that the change in engineering standards (module size in his term) would make the transition easier for the consumer from the standpoint of simple numbers on sizes and quantities.

Most of the foregoing discussion dealt primarily with quantitative aspects of purchasing specifications and problems. It seems that a high level of consumer confusion could be anticipated. Such confusion could safely be predicted as leading to consumer resistance. The question as to the success or failure of an educational campaign which would reach all segments of society during the time available for conversion cannot be answered. But the outlook based on attempts at education of the public in much more general issues such as traffic safety, fire prevention, use of grading standards, etc., in the past is certainly not favorable.

In the actual use of the automobile the question of a modified approach *vs.* a complete approach remains a difficult one. There would be problems in the purchase of gasoline and oil and in the inflation of tires and other routine servicing, but because these activities occur quite frequently and because the consumer has time to convert his thinking from the customary system to the metric system, he would learn the new system quite readily and safely. The situation would be quite different, however, if the driver were behind the wheel of his moving automobile faced with a problem of conversion which he has seldom or never met before and for which he has little time to calculate. The situation could prove to be hazardous.

Considering the number and frequency of informational inputs into the process of driving and the amount of time within which a driver must assimilate the information and incorporate it into some changed behavior under stress conditions, it is likely that the dual system of expression would offer some hazard. And, as a motorist, one hesitates to visualize the consequence of some other driver consulting a dual measurement system road map at turnpike speeds.

When the problems of reeducating the populace are considered one must again consider whether we are talking about a metric system of measurement alone or whether new metric engineering standards are included.

In either case, a process of reeducating rather than starting from scratch is required. This fact is frequently ignored when our situation is compared to other countries which use a metric system. In most European countries the metric system was established before a highly technical society was developed. Their problems were in educating, not reeducating. In our own situation, the problems involved with educating young people still engaged in formal education are probably better understood and susceptible to research and effective instructions than with those people who have completed formal schooling. The questions of resources, media available, and methods are much less well defined when the target audience is virtually an entire populace highly reliant on the use of the automobile. Again based on experience one would speculate that the problem of reeducating in the face of various mental and emotional blocks would be especially difficult with such groups as older people, low income groups, ethnic minorities, those with little formal education, etc.

From an educational viewpoint one might speculate that proficiency in using any expression of measurement is closely related to frequency of use. In a hastily conceived and executed attempt at investigating the degree of familiarity with some of the customary system measurements, one hundred college students were asked to respond to 70 items which tested their knowledge of some of the more familiar and some of the less familiar relationships involved in the customary system (table 7).

The percentage of correct responses for a few frequently used measurements of 100% may seem comforting. However, the percentage of correct responses for some of the measurements which have presumably been taught, for some that are very useful to consumers, and for some that are heavily used in some fields are far from comforting. One colleague's interpretation of this data was "We don't know our present system, so why not substitute another?" This writer, however, prefers the interpretation that frequency of usage is a most effective learning device.

Table 7. Weights and Measures Test

	Percent correct answers
1 minute = 60 seconds	100
1 hour = 60 minutes	100
1 day = 24 hours	100
1 week = 7 days	100
1 foot = 12 inches	97
1 yard = 3 feet	97
1 gallon = 4 quarts	97
1 year = 365 days	97
1 pound = 16 ounces	92
1 leap year = 366 days	91
1 quart (liquid measure) = 2 pints	85
1 quart (dry measure) = 2 pints	66
1 square foot = 144 square inches	55
1 compound interest month = 30 days	55
1 square yard = 9 square feet	53
1 yard = 36 inches	47
1 statute mile = 5280 feet	26
1 short ton = 2000 pounds	26
1 bushel = 4 pecks	25
1 cubic yard = 27 cubic feet	21
1 cubic foot = 1728 cubic inches	17
1 league = 3 miles	14
1 fathom = 6 feet	14
1 cwt. = 4 quarters	14
1 military pace = 2½ feet	10
1 rod = 5½ yards	9
1 peck = 8 quarts	8
1 calendar month = 28, 29, 30, 31 days	8
1 quarter = 25 pounds	7
1 pint = 4 gills	6
1 yard = 4 quarters	4
1 square rod = 30¼ square yards	4
1 palm = 3 inches	3
1 ounce = 16 drams	3
1 barrel = 31 ½ gallons	3
1 hogshead = 2 barrels	3
1 long ton = 2240 pounds	2
1 mile = 8 furlongs	2
1 cord (wood) = 128 cubic feet	2
1 acre = 4 roods	1
1 square mile = 640 acres	1
1 hand = 4 inches	1
1 furlong = 40 rods	1
1 cubit = 18 inches	1
1 dram = $27\frac{11}{32}$ grains	0
1 chaldron = 36 bushels	0
1 rick (wood) regional and variable = 64 cubic feet	0
1 ton shipping = 40 cubic feet	0
1 U.S. standard gallon = 231 cubic inches	0
1 cubic foot = ⅘ of a bushel	0
1 nail = 2¼ inches	0
1 quarter = 4 nails	0
1 cable length = 120 fathoms	0
1 mile = 7½ cable lengths	0
1 nautical mile = 6,080.2 feet	0
1 rood = 40 square rods	0
1 span = 6 inches	0
1 Bible cubit = 21.8 inches	0

CONCLUSION

In attempting a conclusion it can be asserted that often producer and consumer groups recognize a mutuality of interests as they come together in discussion. Added illumination frequently results in clearer perception of common goals. At this early juncture in our search for understanding of the impact of metrication, however, there does appear to be some *divergency* of interests.

Consumers may be asked to undergo certain direct added costs by way of frustration and hazards in exchange for indirect benefits which are hoped to result from increased exports, reduced gold outflow, and increased productive efficiency, all of which have varying degrees of uncertainty.

Some divergence of interest also appears in relation to the timing of metrication. It would then seem that the more quickly industry converts the less costly it would be. On the other hand, if one assumes an increasing proportion of our population is undergoing what is hopefully more effective education, it would then seem that the later the conversion the better it would be for consumers. In one recent book, *Making the Most of Metrication*, reviewing British experience, the single reference to consumers conceded that "the new units of measurement may be unfamiliar to consumers for a time" but dismissed the matter with the observation that "most judgments of whether a measured quantity is likely to meet requirements are made by eye" and the conclusion that "the error will be corrected before the sale is completed [7]."

The National Metric Study Conference devoted to consumer affairs sponsored by the National Bureau of Standards in cooperation with the American Home Economics Association conducted at Gaithersburg, Maryland in October 1970, indicated the need for a somewhat less cavalier attitude toward consumers and the need for a good deal more research.

On a more optimistic note, one might suggest that the changes required by metrication might be used to open the door to bring about other desirable changes considered to be in the interest of consumers. For example, if road signs must be changed, might not the planning include both provision for uniformity throughout the country and some consideration of aesthetic values as well? As another example, legislation which would effectively prohibit resetting odometers might be adopted at the same time that metric readings are required on automotive instrument panels.

It seems that a consumer's view of metrication must consider what priority such action might have as compared to a wide range of other potential changes. This brings into purview a whole host of matters such as quality of environment, resource development and depletion, lack of availability of information regarding quality and performance, etc. which, of course, are not susceptible to discussion here.

REFERENCES

[1] Kenneth H. Taylor, "The Impact of Converting to the Metric System," MSU Business Topics, (Autumn 1969).

[2] J. V. Odom, "Problems of Metric Conversion." *ASTME* Vectors, 1969/4 Issue, p. 17.

[3] "Metrics: A Preliminary Report." *Science News*, p. 297 (October 4, 1969).

[4] Quoted in *Science News*, p. 298 (October 4, 1969).

[5] Odom, *ASTME Vectors*, 1969/4 Issue, p. 18.

[6] Taylor, *MSU* Business Topics, p. 55 (Autumn 1969).

[7] J. S. Vickers, *Making the Most of Metrication*, p. 91 (Gower Press, London, 1969).

AUTOMOBILE REPAIRS AND SERVICING

Herbert Ellinger

College of Applied Sciences, Western Michigan University

UNITS CURRENTLY IN USE

Customary usage units are primarily used in automotive service. Inches are divided into decimal segments. The serviceman works with whole inches plus decimal subdivisions down to .0001″. His measuring tools and specifications are given in inch decimal subdivisions. In most garages, even the hour is divided into tenths for easy use of the flat rate schedules that are used to charge customer labor cost and for keeping track of labor time. The automotive service trade has recognized the advantage of working with the decimal system and has adapted the customary units for use in division by 10, just as in the metric system.

In capacity measure, the automotive consumer works with gallons, quarts, pints and ounces. Normally, smaller capacity units are not required. Volume is generally used in whole cubic inches, with some reference to cubic centimeters on small volumes. Force is measured in pounds per square-inch and torque in pound-foot, pound-inch and ounce-inch. Power is given as horsepower and speed in miles per hour. Electrical measurements in automotive service are in the metric system: the volt, ampere and ohm; but the consumer seldom realizes that these are common metric system units.

The average automotive consumer in the United States received his first knowledge about the metric system when imported cars started to come into the country after World War II. The volume of imported cars has steadily increased until it has become an important segment of the domestic automobile market. The majority of these cars are purchased by economy and sports minded individuals, many of whom do their own service work. Imported cars require few wrench sizes for most routine maintenance work, so the tool cost for this type of work is low. Inexpensive type metric tools for occasional routine maintenance can be purchased for less than $25.00. Metric tools are handled by most tool companies and so they are readily available in the retail market.

As more imported cars enter the domestic market, the consumer becomes acquainted with a few metric terms. Some metric terms have begun to be used to identify specific domestic automobiles and engines. One manufacturer advertises a 7-liter engine and another maker advertises his engine as 1600 cc. One manufacturer identifies his car as a 2300 because its engine has a 2300 cc displacement. The average consumer recognizes these terms as identifying names and does not relate them to metric units.

PRESENT METRIC IMPACT

Most automobile consumers do not know if customary units or metric units have been used to manufacture their car. They usually buy a car for its appearance, its size to fit their needs, its economy, or its performance.

Most metric standard automobile parts are found on imported cars. However, a few stock metric items have been used in domestic cars for a number of years. All domestic spark plugs have metric threads and all high quality ball and roller bearings have metric dimensions. Most service mechanics and technicians do not realize this because the size dimension is not given in their service manuals. The part is replaced using a part number so size measurement is seldom required.

Almost every mechanic has replaced a generator bearing at some time. He is seldom aware that the common 203 bearing is made metric: 17 mm ID × 40 mm OD × 12 mm wide. His specifications are given in equivalent inches of .6693″ ID × 1.5748″ OD × .4724″ wide. The fact that the bearing has a metric size was neither an advantage nor a disadvantage to him. He merely replaced the bearing with a bearing of the correct part number. Metric sparkplugs and bearings are manufactured in the United States and are readily available at standard prices.

The original imported car dealer has all of the tools and trained personnel to give proper service to the new car he sells. The consumer may have difficulty getting satisfactory service when he takes the imported car to his independent repair shop or service station. Many repair shops will not work on imported cars, no matter what standard was used to build it. Their main objection is to poor availability of replacement parts and not the fact that metric standards were used to manufacture the part. Poor availability of parts is often an inconvenience to the consumer because his car must be laid up until the serviceman is able to get the required parts to complete the repair. This is also inconvenient for the serviceman because the disabled car takes valuable space in the repair shop. Many repairmen equate the imported part problem with metric standards when there is actually no relationship.

While import service manuals are available to the import dealership servicemen, it is often inconvenient for the general repair mechanic or service station operator to get detailed service instructions. This tends to further pressure the consumer into returning to his new car dealer for proper service on his imported car. This policy also discourages non-dealer mechanics from working on imported vehicles.

Some imported car sales are handled by domestic new car dealers. In most of these dealerships, one or two men do the service on imported cars, so they are the only servicemen that are required to have metric tools. The consumer service cost is, therefore, comparable to service costs on domestic cars.

Automobiles built to metric standards operate in exactly the same manner as automobiles built to customary standards, the only change being a slight difference in the physical proportions of the parts. The serviceman can diagnose a consumer's malfunctioning metric dimensioned car in exactly the same way that it is done on a car built to customary standards. His only problem occurs when he needs to use tools to remove, service, install and adjust a part held with a metric size fastener. This is a minor problem if he has metric tools. Initially, it requires selecting a wrench size by trial and error until he becomes acquainted with the part sizes. This may take more time, so he often charges the customer for added labor cost which increases the repair bill.

In actual hands-on service, the mechanic becomes accustomed to judging wrench and thread sizes. This is his first concern. As he works with the tools, he gradually learns to think in terms of metric units rather than customary units as he obtains equipment and tools with metric markings and sizes.

Those who regularly work with metric sizes claim that metric sizes are simpler to work with than the customary system units. This seems to be the only possible advantage to the automotive serviceman or to his customer and then only if he is able to do the service more rapidly and lower the labor cost. In actuality, it may be that it is said to be simple only because the serviceman is familiar with the sizes, rather than being a simpler system to use.

In talking to a number of servicemen, it was surprising to learn that they thought the nut and bolt head sizes with metric threads were the only parts of the car built to metric standard units. Service information they use has been converted and the specifications they are required to use are in customary units.

METRICATION IN AUTOMOTIVE SERVICE

Metrication has begun in ASTM and SAE engineering standards. These will most likely affect engineering and manufacturing of automobiles in the future. The large volume of imported vehicles and imported parts that are now being used on domestic cars which are built to metric specifications will undoubtedly bring many metric units into common usage by the automotive consumer.

Mechanics are acquainted with decimal equivalents. Many equate $^{5}/_{16}$ inch to .3125 inch without the use of a decimal equivalent chart. Most mechanics have a decimal equivalent chart in their toolbox, so they can look up any decimal equivalent that they are not thoroughly familiar with. A number of these decimal equivalent charts also include the millimeter equivalent, so metric charts are already available to these servicemen.

Cars imported into the United States have instrument readings in customary units so the driver does not have to convert metric volume, pressure, temperature and speed units into customary units. If total conversion to metric units were to take place, it would require replacement of all of the road speed limit signs. It would most likely require speed limit signs in both customary and metric units for some time. This would surely lead to confusion of the general motoring public.

Metrication would apparently cause no serious problem at the consumer level in automotive service. As far as the consumer is concerned, planned metrication must start with manufacturing. When it arrives at the consumer level for automotive service, the serviceman, with some training and suitable tools, should have no trouble servicing these cars.

Automobile manufacturers currently provide training programs at their training centers for both their dealers' mechanics and for independent mechanics. They find it difficult to get enough mechanics interested to hold classes. Mechanics show little tendency to take advantage of available service training to help them advance their technical knowledge. Generally speaking, it is the most progressive and sharpest mechanics that need training the least who are the ones that take training. The mechanic that needs training the most is the one who shows little tendency to take advantage of available service training. It could be that metrication would further reduce the quality of automobile service because these servicemen would try to "cut corners" even more than they do now. The consumer in this case would be the loser.

If a planned change to metric units were made, it would be necessary to initially write all of the vehicle specifications in both systems so the serviceman could use his present measuring tools or his new metric tools. This dual system would have to be carried on for a number of years until both the vehicle built with customary units is scrapped or the present tools are worn out and replaced with metric tools.

In automotive service, the mechanic or technician is more concerned with operating clearances than with the actual size of a part. Most service specifications are given as a clearance tolerance rather than a size. It would seem practical and convenient to use metric tolerance sizes to the nearest .0002 inch by using .005 mm as the equivalent. This would hold clearances to slightly closer tolerances than using customary units. An example would be using 25 mm per inch instead of 25.4 mm, the actual equivalent to one inch. The error would be only 1.6 percent, which is well within service tolerances.

The serviceman would need metric sized wrenches to fit metric nut and bolt heads. He would also occasionally need metric taps and dies to repair damaged threads. A basic professional quality wrench set that could be added to a serviceman's present tool set would cost about $100.00. This could be expanded to a very complete set for $300.00. If a tap and die threading set is required, it would cost another $100.00. These prices assume the serviceman already has socket handles in fractional drive sizes, pliers, screwdrivers, etc., which do not affect his work on metric size fasteners.

Present test and measuring instruments could be used by making use of conversion charts. This, of course, would take a little longer than having them read directly in the units specified. The extra labor time would be passed along to the consumer as increased labor cost.

To the serviceman, metrication changes would be similar to learning a new product. For example, when alternators replaced generators, the serviceman had to learn to test, inspect and service alternators instead of generators. The same is now true as disc brakes are being installed on domestic cars. Brake manufacturers and tool companies are providing clinics to help train servicemen in the correct use of tools for proper service. Most servicemen have no trouble learning alternators or disc brakes. These same men would have no trouble with metrication. Some of the old-time mechanics would not learn alternators or disc brakes and, therefore, refuse to work on them. These same men would most likely, at first, refuse to learn to work on cars built to metric standards. This may inconvenience some consumers who have been steady customers of these servicemen.

Most people resist change. They will avoid change as long as possible. If change is necessary for their livelihood, they will make the change. It would be easier for the younger people to learn a new measurement system than for the older people. New metric units for weight, force, pressure, capacity, velocity and power would be the most confusing while learning the new system.

The one big problem brought to the author's attention was parts availability. Most present metric parts are imported. Parts are warehoused at several central locations, but it takes a comparatively long time to get them shipped into other locations. If domestic metric parts were produced, domestic dealer's parts departments and wholesale warehouses would have to duplicate much of their stock so they would have a larger investment in inventory and space that these additional parts require. This would be more of a hardship than an advantage during the changeover period. Current parts would have to be held in stock until present automobiles are no longer operating.

SUMMARY

Metric sized domestic automotive parts have no apparent advantage to the consumer and in the present domestic automobile market there is no need for metrication. It would impose a financial hardship on many servicemen. During a changeover, added costs would most likely be passed along to the consumer as higher service costs. Any increase in cost would probably be resisted by the consumer unless it were required by law or gives him added value.

Once the serviceman has metric tools and some training, there should be no serious problem at the consumer level in automotive service.

METRICATION, THE CONSUMER AND ADVERTISING

Theodore F. Dunn

Benton and Bowles

Should the United States decide to eventually adopt the metric system, it might well fall to the advertising industry to help educate the country about these measurements as well as to help motivate consumers to use them. Precisely because of this eventuality, the American Association of Advertising Agencies was asked for their support in the current investigation and appraisal of increasing worldwide metrication. Since it has been part of the advertising industry's function to appraise the needs of consumers and through education and motivation to sell products and services, the "Four A's" felt that it could indeed be of some service in, if you will, the marketing and advertising of metrication.

It was the writer's good fortune and pleasure to be appointed chairman of a 4A's committee to assist in the study of the implications of increasing worldwide metrication on the United States. The 4A's represents some 365 advertising agencies which account for about three quarters of all agency placed advertising in the United States. The Research Directors of six of the largest advertising agencies—Benton & Bowles; Ogilvy and Mather; Norman, Craig & Kummel; Doyle, Dane Bernbach; BBD&O; and Grey Advertising—formed the committee.

The committee's goal was to provide some understanding of three major issues. First, the education of Americans concerning the metric system; second, the motivation of consumers to use this system; and third, the cost of educating consumers, with particular emphasis on who should do it and who would pay for it. Answers to all of these questions cannot be provided at this time, but how the advertising profession would go about getting the answers can be elucidated.

As a first step, an advertising agency seeks to find out everything it can about who are the best customers for a brand or service; what they are like; what they want from the products or services; what they think about the advertised brand; and what they think about competitive brands. In addition, a great deal of information about market activity; both about the brand advertised and competitive brands is uncovered. The reason for obtaining all of this information is to help decide how to position the advertised brand as uniquely and desirably as possible against competition.

Or to put it another way, it must be decided which of the many characteristics of a brand is most important to emphasize or sell. In this sense, and this is not too well understood, advertising is most consumer oriented. It seeks to find out what consumers need and want and then to match what the brands being sold have to offer against these needs. To put it in its simplest form, advertisers have learned a long time ago that it is a lot easier to sell people something they want than to try to sell them something they don't want.

Once the strategy for selling a particular brand is clearly understood, creative people develop advertising to accomplish what it calls for. A good deal of effort is spent to assure that the advertising is on target against the strategy and later to measure whether the advertising has paid off. So advertising works first to develop a strategy, second to execute it and third to check whether or not it has accomplished its objectives.

Some of these principles can be applied to the introduction of the metric system.

Some of the problems consumers would face in adapting to changes in measurement from the English to the metric system include the purchase of clothing, food home products and transportation. Without going into them, the problems are indeed staggering. Fortunately, there is a commonness about the problems that consumers might face. This is, that *knowledge* of the metric system and the *motivation* to use it would alleviate many if not all of the difficulties.

In order to be able to educate consumers and to motivate them with respect to the system, a comprehensive understanding is needed of their current knowledge or lack of knowledge of the metric system as well as of the English system. In addition, good understanding is required of the kinds of advantages and disadvantages they see in a new system—whether these be real or imagined.

In order to do this, our committee has recommended a comprehensive study of consumers' knowledge of the metric system and of their attitudes toward the use of this measurement.

In fact, the Survey Research Center of the University of Michigan has already begun work on an initial study of this kind for the National Bureau of Standards (ch. III). This study which is being conducted among heads of U.S. households, will provide some valuable insights into the knowledge consumers currently have about the metric system and about their willingness or resistance to change.

It begins by finding out whether or not respondents ever heard of the system, and if they did, goes on to probe their knowledge of the names of measures used and equivalences with our present system. In addition, it inquires about people's experience with the metric system in foreign countries and problems encountered in its use.

On the attitude side, it tries to measure how much difficulty people *think* they would have adjusting to such things as "speed limits posted as 80 kilometers an hour instead of 50 miles an hour," or "using recipes that call for nine-tenths of a kilogram instead of two pounds"; whether people think a change to the metric system is good or bad; whether they would be willing to attend lectures to learn the new measures; and finally, how much they agree or disagree with such statements as:

"Shopping and price comparisons would be so much easier because the metric system is decimal."

"The rest of the world uses the metric system or is changing over so the U.S. should too."

"The metric system would be much easier for our children to learn."

"It would be too costly to change over all our household devices."

"Life would just be more complicated; we would have to use conversion tables and people would never adjust."

"It would be expensive for business to change their measuring equipment so they would raise prices."

This study was not designed to be comprehensive in covering all types of U.S. consumers nor in questioning all areas of potential problems associated with consumers' knowledge of and attitudes toward metrication. But the kind of information that can be derived from it can begin to clarify the nature and size of the educational problem and the kinds of positive and negative feelings about the new measurement that would have to be worked with and against.

A more comprehensive study would probe into a broad range of the possible consumer problems among a more representative sample of U.S. citizens. It may find that the resistance to change is so overwhelming and the opportunities for motivating most consumers to accept and use the new system are so few that this information alone would have an important bearing on recommendations to Congress concerning whether or not to embrace the new measurements for the United States.

The first part of this paper has considered primarily, a static kind of a study, that is a study which tells a good deal about how people currently feel. It has not gone into how they may react to social pressure to use a new system, to more information about it, or to compelling reasons to use it. Therefore, a more dynamic study approach to understanding consumers' reactions to metrication is recommended as well.

One other point which is important to note is that there may be very little inherent value to the consumer from a change to the metric system. If this is so, perhaps additional motivation would be necessary to interest people in the new measurements.

For example, consumers might like better standards for their clothing sizes—new standard measurements that might indicate something of the dimensions of the clothing might be desirable. While it is not necessary that this type of standardization accompany the adaption of the metric system, it could very well provide the necessary motivation. Another example of borrowed motivation would involve relating metrication to unit pricing. The metric system being basically a "tens" type of measurement, could make unit pricing much simpler to understand. Again, while it is not necessary that unit pricing accompany metrication, it could provide some extra motivation.

It would appear, however, that a great deal of resistance would not be found, but rather apathy and indifference born of lack of knowledge of the values of the new system and of reasonable satisfaction with the old. At the same time, opportunities would be found to awaken interest in the new system, to provide good and motivating reasons for its use and generally help to develop positive feelings toward a change. At this point, advertising could be of some help.

Before going into the kinds of contributions advertising could make, it should be pointed out that this paper has been talking about studying

Consumers and not about *The Consumer*. This distinction is made because there is no such thing as the average consumer.

What we have are many different kinds of consumers all of whom want and need different things from products and services. And so it would be with consumers' involvement with and their reaction to changes in their measurement system. Some few would be most knowledgeable about both our system and the metric system; others would be much less so—probably the bulk of the population would fall in this category—but rest assured they would vary in their knowledge and ability to use both systems. Many would be resistant to change; others would not. But again, rest assured that the reasons for resistance would vary. Some simply would be apathetic—"Why should we change?" "What's in it for me?" Others would have genuine concern about the confusion that may develop while purchasing; or negative reactions to a "foreign" system; or simply may not wish to relearn. Each of these kinds of people would have to be treated differently. They would have to be educated differently and motivated differently. In recommending a proper program of education and motivation, we must not strive to aim it at the average consumer, because in so doing we might be talking to no one.

Advertising would only be one of the many ways with which the country would attempt education and motivation of consumers relevant to metrication.

On the education side, we have our regular educational system to rely upon. In addition, we could employ such methods as TV lectures, mail-study courses, adult education programs and instructional leaflets. But to get people aware of the change and to move them to want to learn the system and to actually use it is something advertising is peculiarly qualified to do. This is where the understanding gained about consumers' feelings concerning the change to a new system could be used to create the proper receptivity to and involvement with the use of the metric system.

Through the use of TV commercials and print advertisements, virtually every consumer in the country could be reached frequently enough to have considerable impact. By the same token, advertising could be written to treat the different kinds of problems faced by the many different consumers.

How the industry would actually function to accomplish this job cannot be said now. But in the past on matters of public interest, such as advertising for the American Cancer Society, the Peace Corps and other social action programs of value to the country, advertising has worked in the following way. The advertising media have donated time on TV and radio and space in magazines. Advertising agencies have donated their staff and time to the creation of advertising copy—commercials and print advertisements. The only thing that the sponsoring societies or the government have paid for was the actual production of print advertisements and of commercials. It is possible this system could apply to the metrication program.

By way of summary, this paper has tried to emphasize the necessity for understanding consumers' reactions to any implementation of the metric system in the United States. It tries to indicate the role of advertising in educating and motivating consumers with respect to new metric measurements.

It is particularly pleasing that our government has taken the time and the effort to find out a great deal about the implications of the use of the metric system for our industries and our consumers. It is hoped that we in advertising could be of some service to the government in helping the country to adapt to the metric system should it become a reality in the near future.

CONSUMER ATTITUDES TOWARD METRICATION CHANGEOVER FOR U.S.

Margaret Dana

Consultant, Consumer Attitudes and Author of Syndicated Consumer Information Columns, "Before You Buy," and "Consumer's Question-Box"

For several years letters from consumers from time to time have asked, "When will this country start toward the metric system? What can we do to start it moving? What holds us back?"

The letters began to come in, and are still coming. Many of the comments were part of long letters discussing several subjects. But 219 of them dealt exclusively with one thing: the metric system and possible change to it in this country. This is not a definitive or conclusive sample but in accord with the laws of probability I would say it represents some dependable clues to what people, generally, think. Let me give you a quick picture of what kinds of people, living where, wrote these letters.

First, they come from all our regions: New England, Middle Atlantic, Middle South and Deep South, Middle West, Far West, West Coast, and Hawaii. They come from farms, small towns, cities, suburbs and ghettos. The proportions of each are fairly steady, with perhaps more from towns around big cities than from any one other section. There is clearly an almost equal interest in the subject from each type of background.

Who are they? How old are they, and what do they do? Again there is almost equal division of age levels. Often the writers mention their ages, or imply them, or give details which place them in their age grouping. If there is any edge in the number, it is for the middle, average ages and occupations—homemakers, secretaries, clerical personnel, medical technicians, nurses, men and women in factories and sales jobs. Next largest section is the rather better educated—university and college faculties, school teachers, industry management heads, economists, college students, etc. Their ages run from teens to the ranks of the elderly.

Interestingly enough, many letters came from the supposedly lower educational levels. Some were from isolated old-timers, some from minority group members, the underprivileged, and so on.

In addition I checked by transatlantic telephone with two key points in Great Britain—the British Consumer Council and the Retail-Trading Standards Association. Their comments on metrication are stimulating.

As I studied the sampling of 219 letters, I first separated the "fors" from the "againsts." To my surprise, I found the figures running almost 10 to 1 *in favor* of a metric changeover.

Then I sorted the letters according to the primary thought theme each expressed. The subject headings read like this:

"Easy to Use . . .," "Students find it simple," "Not too old to learn," "International goodwill aided," "National 'Help Each Other' result," "Professional People tell why," "Many with Experience *Abroad* with Metric," "Actual Consumer Petitions for Metric," "Suggestions on 'How-to-do-it,'" "Those *Against* Metric and why," "Spokesmen for Great Britain."

All these letters are interesting and informative, for they give a very clear psychological picture of widespread attitudes and opinions. Let me select some significant samples for you to read.

Under the heading "Metric's so easy to use," a woman in Massachusetts says, "Having been in Europe and Israel for some time, I know that once one gets used to the terms it becomes *very easy to use*—especially when it comes to converting into large or small quantities. In fact after using the metric system for a year, and coming back to the U.S. I found it much more difficult to use ounces, pounds, pints, feet, yards, miles, etc."

A San Francisco consumer says: "It is *much easier* to use than our present system and would prevent lots of mistakes." A Cleveland woman wrote: "Metric System is simple and *much easier to use*, although we all might need new measuring cups and spoons, but would get used to it easily." Another Californian says: "I will be surprised if your mail indicates the average consumer is in favor of the change; because it's new, it's confusing, but I am sure it will be easier to use, the relationships are so simple, once the terminology is learned."

Another West Coast consumer said: "Through experience I have found the metric system to be easy, fast and efficient, once learned. It makes shopping and cooking easier. Women may not realize it now, but it is a blessing to the homemaker." Still another makes this point: "I am sure it would make marketing easier for those housewives who need to know instantly the unit cost of each item in their shopping baskets."

A reader in Arizona wrote: "After reading your column on the metric system I looked up the subject in one of my husband's mathematics reference books, and now believe it really *would* simplify things." A letter from the State of Washington I especially enjoyed, for I have a fellow-feeling. She said: "I am in favor of metrication primarily because it is so much simpler and also because I have never been able to learn how many feet are in a mile."

That's a sample, but you see the emphasis on "*easy to use,*" for women, homemakers. (The assumption has been that it would be very difficult.)

The next category is "Students—They Find It Simple." From Fresno, California, a letter writer said: "Every year students in this country taking high school or college chemistry use the metric system, and with a minimum degree of difficulty for most. They adjust because they have to, it is a required course." A woman in Virginia says: "The accuracy, practicality and simplicity immediately place the metric system above all others. From personal experience I know how readily young schoolchildren in Europe grasp the fundamentals and how easily they manipulate the figures." From Oregon comes this statement: "In checking around our group of friends and relatives, every one under 30 has had the metric system in grade school and high school. All who work in scientific or engineering related fields must work with both systems."

Two letters from Sacramento, California, mention that in the state with its median education of a least 13 years, the metric system must be familiar to most young people there. Its introduction generally would also "reduce the number of measurement systems which nursing, medical and science students must learn and use." A man in Milwaukee says he feels the country could begin adopting the system now, with the complete changeover date some time in the future, 5 to 10 years. "The system could be taught immediately in schools everywhere and the generations coming up could learn two systems, just as European children learn their own language as well as English."

An Oregonian's letter said: "When I was in the 8th grade the teacher told us how much simpler the metric system is. We all learned it and planned on using it in everyday life in the near future. That was in 1926."

Nearly everyone I've talked to about the problems involved with changing to the metric system has felt that however younger people might adapt, the real trouble would be with the elderly consumer who couldn't or wouldn't learn new ways. To an extent this probably is true, but don't take if for granted. Many women in their seventies and eighties are proud of being able to learn and adapt. One woman in Arizona wrote that although it had been 30 years since she graduated from school *she* was ready for the change, but the "die-hard older generation would have to be schooled to it in some special way." Another woman wrote that though she was in the older years, she felt never too old to learn. From Iowa a consumer writes that she studied high school physics forty years ago, and has always been ready to accept metrication.

A Portland, Maine grandmother of 67 says, "Here is one hearty approval of the change to metric weights and measures (My B.A. in 1924)." A pair of elderly readers said: "It will no doubt be difficult for those of our age to adjust to metrication, but we think for the future it is a step in the right direction." And a Seattle reader suggests, "If this country, and perhaps the world, is to be ruled by young people, they would adapt to it quickly and we oldsters would soon die off anyway. I'm for metrication.' "

A number of people brought up the point that for the U.S. *not* to change as almost all major countries have changed to the metric system, or are planning to, would set up a barrier between us and others. One says: "If we are not to be isolated from the rest of the world, the sooner the better we change to the metric system." Another letter asks: "Why hold ourselves aloof from the rest of the world? The changeover could also perhaps help our export system urgently needed for our economic progress."

A California woman sent a most thoughtful letter. Her point is: "In this age of communication gaps between peoples, it seems to me we should try to minimize all areas of friction or lack of understanding and here is an area where we can adopt the best and do ourselves and everyone else tremendous good." A rather remarkable letter came from a homemaker in Connecticut. "There might be an extra 'spin-off,' " she says, "an advantage that is not so obvious." Whenever there is a crisis or need for help anywhere we help each other. We rally round. So visualize this scene: everyone with a handy-instant converter in his hand. Everyone feeling just a little stupid; no one really in a position to feel superior to anyone. There we are, standing at a counter in the store wondering how many decimeters of cloth we need, or kilograms of sugar. So we smile, looking a little foolish, and someone else smiles, sees you need help and comes over *to* help. People are beginning to relate to each other. Converting to the metric system might be just the thing to 'bring us together.' "

As you would expect, the collection of letters from various professionals such as teachers, lawyers, doctors, etc. were particularly informed and to the point. A man in Virginia who works for an engraver and stationer, also had a good angle. He wrote that the metric system would help greatly with their everyday problems which grow huge at inventory time. "Counting merchandise in dozens, grosses, pounds, means a lot of lost time and frustrations arriving at the proper count for inventory." A Junior High teacher in New Jersey reports: "My eighth graders conducted a debate on the English versus the metric system. Even though they groaned at the mention of studying the metric system, a large majority in each class (total of 57 students) voted for the use of the metric system after the debates."

A teacher on the West Coast said: "I am annually faced with the impossible task of teaching and reteaching our present system of measurement. Children just do not understand it. I wholeheartedly support the adoption of the metric system." A moderator of a 'talk show' on the radio in Illinois, writes "In this very conservative area of NW Illinois, this is one change which a majority of our listeners seem to be for." The Chairman of a department of fashion design in a southern university tells how she has believed for long that pattern makers must shift to the metric system. "An international method is essential and the metric system is most practical and the easiest to learn because of its logical decimal system."

A spokesman for the Women's Lib movement also got into the act. Her letter urges me to make sure the Secretary of Commerce doesn't let the National Bureau of Standards use the measurements of a pin-up girl to effect the change, or exploit a woman's body to get the attention of people learning the metric system.

One thing which has been quite often overlooked when appraising the difficulties that may lie ahead for us in a metric changeover, is the fact that today there is a solid core of thousands of people, men and women, who have lived in a country which uses the metric system, and then come home to the U.S. wishing we had it here. These are army people, usually, or foreign business management families who have had tours of duty abroad. They are missionaries in their own communities, urging the metric system. One such woman wrote: "As an unmathematical type of female I can heartily vouch for the metric system. It's much easier to learn than pounds, ounces, etc. I spent some years in Europe and found their system a snap to learn."

A Seattle reader says: "I don't need to think twice about voting for the metric system. I am all for it. I have lived in different countries that use the metric system and believe me, it's a lot easier to keep an eye on your money that way, especially if you're on a limited income." Another tells me, "As a military wife I've had the pleasure of living in Germany 5½ years. The metric system is the greatest! I have kitchen scales, measuring cups, thermometers in the metric system, as well as a conversion chart. I think it would be a great service to consumers if the U.S. went metric."

There are many more like this, and they are to be reckoned with. Ten years have produced some sophisticated attitudes among many young women, and many others have traveled extensively in these days of easy tours by plane. It was interesting, too, to receive literal petitions signed by many people asking help in getting the metric system under way. One card says "We cast seven votes for the metric system. Postcards to our senators and representatives already sent." And from Milwaukee came an honest-to-goodness petition signed by 23 men and women, who as consumers want the metric system.

Now we come to some practical suggestions from people as to how they think we could begin the changeover. An Oregon consumer says he thinks volume and weight would be fairly easy—could be begun at once, but length will take more time and work. A Pennsylvania consumer says she believes with the extensive use of TV today, people could be taught through that medium very quickly—*seeing* how it works. This agrees with the study made recently by the University of Vermont which found that generally the many women they contacted were not antagonistic to the change, but persistently suggested it be implemented by *use* of actual measuring tools: cups, spoons, pans, "yard-sticks," etc. instead of using charts, books or printed matter.

A San Francisco woman says her neighbors and friends have talked this over with her, and there is agreement that even hesitant or disapproving people could be convinced with careful, clear and repeated explanations using everyday situations familiar to them. Another suggestion that came in was for the change to come gradually, a 3- to 5-year interval, she thinks, with *both* systems printed on labels for a time, and getting the medical and scientific people to help as missionaries. A reader in Roanoke thinks 10 years is a better period to allow. He believes a thorough system of education worked out by the NBS *with a consumer advisory committee* would do the job without trouble. An Assistant Professor at the University of Iowa agrees, and suggests ways of getting the public used to metric terms and meanings.

A doctor in Oregon suggests industry be persuaded to help with give-aways providing metric measuring tools, like "meter sticks." It would soon become common knowledge. Two letter writers felt a *better* system than the metric system based on tens, would be the Basic 12. They felt it was not really necessary to make use of the count of our fingers in creating a better system. Their arguments are interesting, but seem not to get consumers interested.

All of the letters offering ideas on "how to do it" underline one very good thought: make use of those who support the changeover to become community aides in bringing understanding and effective use into play, once the changeover is decided upon. Neighborhood committees could help at stores or wherever people need a little information at the point of sale. These letters that have come to me show that the majority would willingly take part in this. So we would have a national network *of volunteers for the metric system.*

Finally, in fairness, let's look at the letters against the metric changeover.

They are all very much alike. Some just say, "Forget it!" others, "What was good enough for my father and mother is good enough for me and my children." Others just shudder and run, verbally. One letter cited a book, "Methods of Machine Shop Work," with a chapter entitled "Metric Fallacy" by F. A. Halsey, published by McGraw-Hill. He says this chapter will cure anyone of the desire for the metric system.

There are letters saying it's fine for the U.S. to stand alone with a different system. Other letters say, "I'm too old to learn." And a real estate lawyer describes as terrible, the confusion that would result if the metric system were applied to the measurements of lands, and deeds on file.

In two overseas phone calls to London I collected two different points of view. I'll give the decidedly violent opposition first. This from Rodger Diplock, Director of the Retail Trading-Standards Association of Great Britain, and an old friend of mine, which explains his informal language. He says, "As regards 'going metric,' everybody here hates the guts of every person who thought it was a good idea to change from miles to kilometers. I suppose we are prepared to accept decimalization next February, on the basis we shall be going into the Common Market (which Heaven Forbid). As to metrication, the cost to this country will be absolutely staggering and I wish to know nothing of it. In any case I shall still go on walking a mile to my local pub instead of working it out in kilometers."

But Miss Sheila Kemp, an executive with the British Consumer Council, feels people are being prepared for the change, and will gradually accept it if enough clear explanations are made when metrication actually starts. Some British consumers, she says, feel that the change to the decimal money system due in February, 1971, is a chance to let industry raise prices. They also feel the new measurements of the metric system would let industry use "tricks" to raise prices and cut amounts of goods received. Miss Kemp feels strongly that this is the result of not getting the right words and the right facts into the general communication channel, to help people understand how the old and new systems compare.

That the costs of change will be at least in part handed on to consumers is a fact. But that it can save money for them later on, is also a fact. It is going to take skillful art and highly competent word masters to bridge the communication gap in our own country, if the metric system is not to divide us further and create ill will at the grass roots. But I believe it is psychologically possible and has greater consumer support than is usually realized.

Appendix 1

Public Law 90-472

An Act

82 STAT. 693

To authorize the Secretary of Commerce to make a study to determine the advantages and disadvantages of increased use of the metric system in the United States.

Metric system. Study.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of Commerce is hereby authorized to conduct a program of investigation, research, and survey to determine the impact of increasing worldwide use of the metric system on the United States; to appraise the desirability and practicability of increasing the use of metric weights and measures in the United States; to study the feasibility of retaining and promoting by international use of dimensional and other engineering standards based on the customary measurement units of the United States; and to evaluate the costs and benefits of alternative courses of action which may be feasible for the United States.

Investigation and appraisal requirements.

SEC. 2. In carrying out the program described in the first section of this Act, the Secretary, among other things, shall—

(1) investigate and appraise the advantages and disadvantages to the United States in international trade and commerce, and in military and other areas of international relations, of the increased use of an internationally standardized system of weights and measures;

(2) appraise economic and military advantages and disadvantages of the increased use of the metric system in the United States or of the increased use of such system in specific fields and the impact of such increased use upon those affected;

(3) conduct extensive comparative studies of the systems of weights and measures used in educational, engineering, manufacturing, commercial, public, and scientific areas, and the relative advantages and disadvantages, and degree of standardization of each in its respective field;

(4) investigate and appraise the possible practical difficulties which might be encountered in accomplishing the increased use of the metric system of weights and measures generally or in specific fields or areas in the United States;

(5) permit appropriate participation by representatives of United States industry, science, engineering, and labor, and their associations, in the planning and conduct of the program authorized by the first section of this Act, and in the evaluation of the information secured under such program; and

(6) consult and cooperate with other government agencies, Federal, State, and local, and, to the extent practicable, with foreign governments and international organizations.

Results of changes in measurement system.

SEC. 3. In conducting the studies and developing the recommendations required in this Act, the Secretary shall give full consideration to the advantages, disadvantages, and problems associated with possible changes in either the system of measurement units or the related dimensional and engineering standards currently used in the United States, and specifically shall—

(1) investigate the extent to which substantial changes in the size, shape, and design of important industrial products would be necessary to realize the benefits which might result from general use of metric units of measurement in the United States;

(2) investigate the extent to which uniform and accepted engineering standards based on the metric system of measurement units are in use in each of the fields under study and compare the extent to such use and the utility and degree of sophistication of such metric standards with those in use in the United States; and

(3) recommend specific means of meeting the practical difficulties and costs in those areas of the economy where any recommended change in the system of measurement units and related dimensional and engineering standards would raise significant practical difficulties or entail significant costs of conversion.

Report to Congress.

SEC. 4. The Secretary shall submit to the Congress such interim reports as he deems desirable, and within three years after the date of the enactment of this Act, a full and complete report of the findings made under the program authorized by this Act, together with such recommendations as he considers to be appropriate and in the best interests of the United States.

Funds.

SEC. 5. From funds previously appropriated to the Department of Commerce, the Secretary is authorized to utilize such appropriated sums as are necessary, but not to exceed $500,000, to carry out the purposes of this Act for the first year of the program.

Expiration date.

SEC. 6. This Act shall expire thirty days after the submission of the final report pursuant to section 3.

Approved August 9, 1968.

GLOSSARY

1. *Customary System:* the system of measurement units (yard, pound, second, degree Fahrenheit, and units derived from these) most commonly used in the United States. Often referred to as the "English system" or the "U.S. system." Our customary system is derived from, but not identical to, the "Imperial system," the latter has been used in the United Kingdom and other English-speaking countries, but is being abandoned in favor of the metric system.

2. *Metric System:* the measurement system that commonly uses the meter for length, the kilogram for mass, the second for time, the degree Celsius (same as "Centigrade") for temperature, and units derived from these. This system has evolved over the years and the modernized version today is identified as the "International System of Units," which is abbreviated "SI."

3. *International System of Units (SI):* popularly known as the modernized metric system, it is the coherent system of units based upon and including the meter (length), kilogram (mass), second (time), kelvin (temperature), ampere (electric current), and candela (luminous intensity), as established by the General Conference on Weights and Measures in 1960, under the Treaty of the Meter. A seventh base unit, the mole (for amount of substance) is being considered as another SI base unit. The radian (plane angle) and the steradian (solid angle) are supplemental units of the system.

4. *Metrication:* any act tending to increase the use of the metric system (SI), whether it be increased use of metric units or of engineering standards that are based on such units.

5. *Planned Metrication:* metrication following a coordinated national plan to bring about the increased use of the metric system in appropriate areas of the economy and at appropriate times. The inherent aim of such a plan would be to change a nation's measurement system and practices from primarily customary to primarily metric.

6. *Cost of Metrication:* that increment of cost, monetary or otherwise, directly attributable to metrication over and above any costs that would have been incurred without metrication.

7. *Benefits of Metrication:* monetary and other advantages accruing as a result of increased use of the metric system.

8. *Measurement Standard:* a device or physical phenomenon that is used to define or determine a characteristic of a thing in terms of a unit of measurement established by authority. Examples are gage blocks, weights, thermometers, and mean solar day.

9. *Engineering Standard:* a practice established by authority or mutual agreement and described in a document to assure dimensional compatibility, quality of product, uniformity of evaluation procedure, or uniformity of engineering language. Examples are documents prescribing screw thread dimensions, chemical composition and mechanical properties of steel, dress sizes, safety standards for motor vehicles, methods of test for sulphur in oil, and codes for highway signs. Engineering standards are often designated in terms of the level of coordination by which they were established (e.g., company standards, industry standards, national standards).

FORM NBS-114A (1-71)

U.S. DEPT. OF COMM.
BIBLIOGRAPHIC DATA SHEET

1. PUBLICATION OR REPORT NO.

2. Gov't Accession No.

3. Recipient's Accession No.

4. TITLE AND SUBTITLE

The Consumer

5. Publication Date
July 1971

6. Performing Organization Code

7. AUTHOR(S) Survey Research Center et al
Editor: Bruce D. Rothrock

8. Performing Organization

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

10. Project/Task/Work Unit No.
4063129

11. Contract/Grant No.

12. Sponsoring Organization Name and Address

13. Type of Report & Period Covered
Interim

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

This report, one of a series prepared pursuant to the U.S. Metric Study Act, presents information on U.S. consumers' knowledge of the metric system and attitudes and opinions regarding metrication in the U.S., and discusses the effects of increasing worldwide metric usage on selected areas of consumer concern. This study is based on (1) an extensive survey conducted by the Survey Research Center of the University of Michigan and (2) prepared expert papers on selected areas of consumer interest. The survey data permitted an analysis of the receptivity of consumers to metrication, and of the need and possible effectiveness of a program to educate citizens should planned metrication be undertaken.

17. KEY WORDS (Alphabetical order, separated by semicolons) Consumers; International System of Units; metric conversion; metric system; metric usage; metrication; metrication, attitudes toward; metrication, costs and benefits of; metrication, impact of; National Metric Study Conferences; SI; U.S. Metric Study

18. AVAILABILITY STATEMENT

☒ UNLIMITED.

☐ FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NTIS.

19. SECURITY CLASS (THIS REPORT)
UNCLASSIFIED

20. SECURITY CLASS (THIS PAGE)
UNCLASSIFIED

21. NO. OF PAGES
152

22. Price
$1.25

USCOMM-DC 66244-P71

U. S. GOVERNMENT PRINTING OFFICE : 1971 OL - 426-991